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A Prosperous Industry

1937's Good Showing

WE doubt whether there was ever so good a year as 1937 for the electrical industry as a whole.

Never before has there been such an unbroken record of increased prosperity in all branches.

In the electricity supply section we expect continued progress, and so the reports of developments and larger sales are nothing out of the ordinary. It has been observed, however, in many cases that profits did not advance at the same rate, owing partly to the continued reduction of charges and partly to rising costs—particularly that of coal. The general advance is evident from the figures of output published by the Electricity Commissioners, which showed for the year an increase of 13.3 per cent. in energy generated, raising the total to 22,905 million kWh.

It follows from the foregoing that there must have been more work for the other branches of the industry. It is not easy accurately to gauge the effect on the installation trade, but the unemployment figures prepared by the Ministry of Labour provide a rough guide. At the beginning of last year the number of registered unemployed in the electrical wiring and contracting industry was given as 10.3 per cent., which compared with 14.3 per cent. in January, 1936. This difference persisted through most of the year, though it narrowed down towards the end, and the proportion was actually slightly higher in December than in the last month of 1936.

Another pointer is the state of the electrical export trade. Throughout the whole of 1937 the monthly total consistently showed improvement, culminating in December in the highest figure reached since November, 1929. The result was that the total for the year was 22 per cent. higher than that for 1936.

All the foregoing facts suggest that the manufacturing companies in the industry should have had a good year and, as a matter of fact, their reports and chairmen's speeches are a tale of almost unbroken brightness.

The developments in distribution naturally had a beneficial effect upon the business of the cable makers and substantially increased business has been reported by the leading concerns. Henley's, for instance, surpassed even their former achievements at home and overseas; B.I. Cables reported new records and Sir Alexander Roger referred particularly to important foreign contracts; Johnson and Phillips made the largest profit since their formation and raised their dividend; Enfield Cable Works had a record output, although the profit for the year was lower than that for 1936; the Telegraph Construction and Maintenance Co. reported similar circumstances.

The switchgear makers did well. Reyrolle's report showed continued advance and export orders accounted for much of this. Switchgear and Cowans revealed a substantial rise in the profits, enabling the company to maintain its 20 per cent. on larger capital. Allen West & Co. were able to resume dividend payments after an interval of ten years.

As regards the "heavy" manufacturers (whose business, however, embodies also smaller equipment) the record is even better. The two principal members of the A.E.I. group, the British Thomson-Houston and Metropolitan-Vickers Co., received large orders and reported good results. Sir Felix Pole at the A.E.I. meeting referred especially to the companies' satisfactory export trade. Probably the most notable report was that of the English Electric Co., which showed a rise of about 55 per cent. on the 1936 figure, which itself was a high one. This enabled the company to pay its first ordinary dividend (10 per cent.) since 1924. Laurence, Scott & Electromotors experienced a 50 per cent. increase in output, which permitted them to more than double their ordinary dividends. Similar results were secured by Lancashire Dynamo & Crypto, Ltd., who paid a larger dividend on increased capital.

These examples give a fair view of the situation of the industry generally during the past year, but there are indications that it was a peak year. Many chairmen have uttered mild warnings that possibly things will not be quite so rosy this year, but given an improvement in foreign affairs and quiet conditions at home there seems to be no reason for anticipating a serious setback in an industry so stable as ours.

Practice at Barton

WHILE the new plant at Manchester's chief generating station represents a steady evolution in engineering rather than an attempt to depart from established practice, there are many points of interest in its design. A compromise has been made in regard to steam conditions; the pressure remains at the original 375 lb. per sq. in., but the temperature (the more important factor) is raised to 875 deg. F., at which it is automatically held within close limits. Some unusual features have been introduced in the circulation system of the 200,000-lb. boilers with a view to securing free and rapid circulation, such as the means adopted for feeding the radiant and convected heat surfaces at as low a temperature as practicable. In the furnaces, provision has been made for the use of a higher proportion of secondary air for combustion than is customary. Regarding the turbo-alternator, the most notable feature is the method of winding the stator for 33-kV with a view to giving a high insulation strength between turns. Switching at 33 kV, although the older generators were wound for 6.6 kV, with 1,000,000-kVA circuit-breakers, is not new to Barton, which was a pioneer in this direction.

Street Lighting

IN an article which appeared in our columns recently, a well-known authority on illumination questions criticised the Ministry of Transport's Report on Street Lighting on account of its brief dismissal of cut-off fittings. In view of the relationship between cut-off and the evil of glare, the subject is one that invites a good deal of discussion, and Mr. R. Maxted's contribution to this issue will be welcomed by many of our readers. In regard to the Report itself, while its recommendations may be regarded as generally sound, it is important to bear in mind that they are necessarily based upon present-day opinion. The methods by which they are carried out must be flexible enough to avoid any risk of their hampering progress.

Engineering Status

A PROPOSAL to form an "Engineers' Guild" will be put before a meeting to be held on Monday at 7 p.m. at the Caxton Hall, S.W.1, at which Sir John Thornycroft will occupy the chair. Such a body, made up of members of the major institutions, would have as its object the improvement of the status of the engineer and the provision of a means of expressing engineering opinion on matters of public policy. Its main concern would not be technical, but ethical—the duty of engineers to one another and to the public. Some of its proposed activities are already covered by appropriate bodies. The latter have, however, a restricted field and would probably be helped by the adoption of a code of professional conduct by possible competitors. There is also the question of the function of the proposed Guild in regard to public relations, which has a bearing on the subject of status, and represents an activity that is now covered by an officially appointed Committee of the more important institutions. The latter, by the way, has been instrumental in obtaining recognition of the status of Chartered Electrical Engineers as proper persons to sign the declarations of applicants for British passports. In the emphasis that it lays upon the need to interest students in its objects, the provisional Committee of the Guild has, at any rate, shown that it realises what is the first essential for the prolonged existence of such an association.

I.E.E. Council's Report

CO-OPERATION between the different branches of engineering was also a prominent feature of the report of the Council of the Institution of Electrical Engineers for 1937-38, which was presented at last night's annual general meeting. Concerted action in view relates not only to headquarters but also to local centres at home and abroad—a matter of at least equal importance, since there are often too few of any one kind of engineer to form healthy separate local organisations. Another new scheme is the setting up of a Joint Examination Board, on which the I.E.E. will be represented. Although candidates for student membership are not at present required to pass an examination, the scheme will be available if it is regarded as desirable in the future. The number of those enrolled as I.E.E. students is now 3,084, with an average over the past four years of about 2,870. The total is more than maintained by 850 entrants (1,000 last year), nearly half of whom go on to pass the graduateship examination. On the other hand, too many—equivalent to 40 per cent. of the new members and 12 per cent. of the total—allow their membership to lapse or resign each year. This would appear to indicate that some form of preliminary examination would not be a bad thing, if only to emphasise the responsibilities as well as the privileges of membership of the Institution.

Industrial Psychology

THE practice of psychology is as old as civilisation, but its formulation (if it can be said yet to have been formulated) as a science is of fairly recent date. In the political sphere its value is acknowledged; in industry its usefulness is gaining increasing recognition. Both the worker and his employer can benefit from the study and application of psychological principles. By systematic training, people in works and offices can be shown how to do their work easily and comfortably with the result that their efficiency and output are raised. More important than this, however, is the employment of the psychological method to select people for particular work, having regard to their natural aptitude and general "make-up." The provision of such services is the function of the National Institute of Industrial Psychology which has just issued an appeal for £250,000 to enable it to acquire suitable headquarters and to expand its work. The value of the Institute to industry is attested by the presence on its Council of leaders in all branches of industrial life. The joint appeal secretaries are Messrs. R. E. Rawson and S. E. Wadey, Aldwych House, W.C.2.

The Hire Purchase Bill

THE encouragement of the growth of hire-purchase trading is an essential part of the policy of all electricity undertakings, and any serious impediment would be most detrimental to their growth. From the summary, on a later page, of the main provisions of the Hire Purchase Bill, which last week passed its third reading, it would seem that, while it may necessitate some exact clerical work, it should not injure the success of one of the most important branches of the electrical industry. However, on the report stage of the Bill Mr. Ede made the point that, if the measure should prove harmful to municipal electricity and similar undertakings, he hoped that it would be possible for the Electricity Commissioners or some other appropriate body to promote a small one-class Bill to put the matter right.

A check in N. Ireland

ACQUISITION of other undertakings during 1937 obscures the true extent of development achieved by the Electricity Board for Northern Ireland, but it is clear from the annual report that the expansion in sales is lower than might reasonably have been anticipated in view of the Board's vigorous development policy. Exceptionally mild weather is said to have had an adverse effect on electricity consumption, and the recession in industry has also been felt. In particular, the linen industry has been hit by the falling off in the American market and the virtual suspension of shipments to China. Fortunately, as far as the Board is concerned, this was offset by the connection of a number of new power consumers, so that, although the marked increase which might have been expected did not accrue, there was still an improvement. Moreover, progress in the domestic field continued to be satisfactory.

New Generating Plant at Manchester

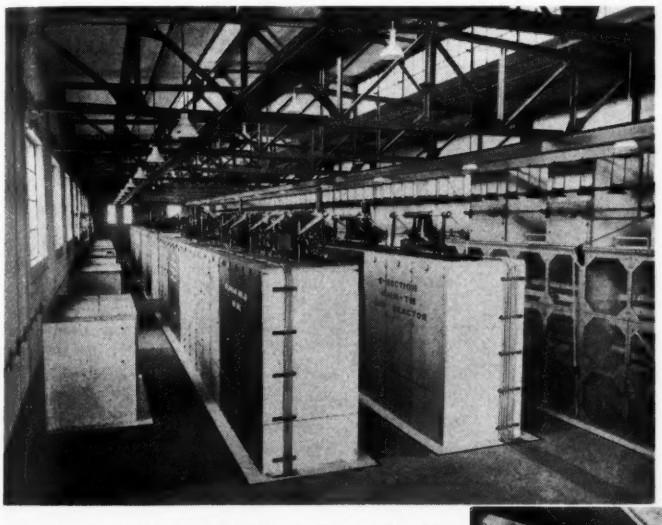
Barton power station completed

The 51,500-kW extension at Barton, inaugurated last Tuesday, brought the station up to its full capacity of 178,000 kW. A further 30,000-kW set is now being installed at Stuart Street which will raise the capacity there to 143,500 kW

ESPECIAL significance in the electrical sense has been given to the civic centenary of Manchester Corporation by the completion of Barton power station and the opening of new showrooms and offices for the Electricity Department. The extension of the generating plant was officially inaugurated on Tuesday (appropriately following a commemorative exhibition staged in the City Hall last week) by Sir Leonard Pearce, formerly chief engineer and manager at Manchester and now engineer-in-chief of the London Power Co.

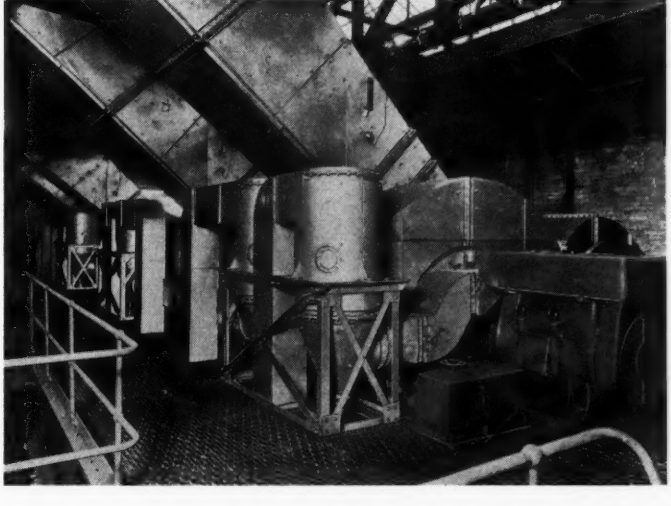
With the putting into commission of 51,500 kW of generating plant, Barton now reaches its full capacity of 178,000 kW. This makes the second extension of the station, the original three 27,500-kW turbo-alternators installed in 1923 having been supplemented by a 41,000-kW set in 1928 in a new wing of the building. The latter has been extended by 85 ft., allowing the new turbo-alternator to be in line with the earlier machine.

A further 98½ ft. has been added to the boiler house, which is situated between the two wings, for the accommodation of



The oil switch and reactor floor of No. 2 switchhouse at Barton

two twin-flow tri-drum bent-tube boilers each with a maximum continuous evaporation of 200,000 lb. per hour, at which the designed efficiency is 84.5 per cent. when using average fuel. The circulation in the radiant heat system of these boilers is from the main drum by external downcomers to distribution drums at the base of the water walls, the water being taken from a point near the entry of feed water to the steam drum. The steam pressure is 375 lb. per sq. in. as before, but its temperature



View of the fan floor showing the induced draught fans and secondary dust collectors

is 855 deg. F.—an increase of 125 deg. The temperature of the feed water is 310 deg. and of the flue gas (final) 240 deg.; 12½ per cent. CO_2 is recorded at the air-heater outlet. Heating surfaces of each unit in sq. ft. are: boiler, 18,856; water walls and arches, 2,984; "MeLeSco" superheater, 7,650; Foster gilled-tube economiser, 14,820; two Howden-Ljungstrom rotary air heaters, 35,600.

The volume of each combustion chamber is 12,650 cu. ft. and the water-cooled walls include 192 3¼-in. (outside) diameter steel tubes lined with refractory tiles. Chain-grate stokers (two separate units per boiler) have been supplied by International Combustion, Ltd., for burning 10¾ tons of coal per hr. on an area of 532 sq. ft. (19 by 14 ft.), from which the ashes are discharged into the common ash-sluicing system.

Steam temperature can be controlled with ± 10 deg. F., when the output is between 150,000 and 220,000 lb. per hr. either automatically or manually, the superheater being divided into two sections with an intermediate de-superheater in the water space of the boiler which can be by-passed by means of a Kent thermostatic relay. In order to obviate the risk of the steam reaching the older turbines at a temperature for which they were not designed, thermostatic control of the de-superheater is also exercised from points on the steam range.

Equipment for each steam raising unit also includes Howden forced-and-induced-draught fans (the latter with integral scroll and vortex grit arrestors) both with Tate vane control, a secondary-air fan capable of dealing with 25 per cent. of the total air for combustion, remote water-level indicator, automatic feed and water regulators, Parry soot-blowers and six 5-ton Simon "Reform" coal weighers. The indicating and recording instruments, which maintain a continuous check on the performance of the plant, are flush-mounted on a cubicle-type control panel on the firing floor.

Three new boiler-feed pumps have been installed, two of the multi-range centrifugal type are driven at 1,470 r.p.m. by 600 and 575-h.p. motors; the third is driven at 3,000 r.p.m. by a single-stage impulse steam turbine and comes into commission automatically in the event of an abnormal drop of pressure in the feed system. Duplicate single-effect coil-tube evaporators, capable of providing make-up for all the boilers in the station, are included in the new equipment.

The new turbo-alternator set consists of a 1,500-r.p.m. impulse steam-turbine with separate h.p. and l.p. cylinders with an intervening Bibby flexible coupling driving through a semi-flexible corrugated-shell coupling a 33-kV alternator with a maximum continuous rating of 50,000 kW at 0.7 power factor. Each turn of the 33-kV stator winding is insulated for full voltage to earth and each phase is divided into three sections with the insulation graded in three steps from line to star point. Its rotor, weighing 68½ tons, was constructed from three forgings.

An extension of the shaft carries the rotor of a 1,500-kW (0.8 p.f.) 420-V house-service alternator, two exciters under one yoke (one of 180-kW at 285-V for the main alternator and the other of 37.5-kW at 120-V for the house alternator) and a pilot exciter.

Ventilation of the main alternator requires 80,000 cu. ft. of air per min. at loads above the most economical rating, when the output of the rotor fans is supplemented by an external motor-driven fan. The area of the cooler in the closed-air circuit is 8,900 sq. ft. and the amount of cooling water is 60,000 gal. per hr. The house alternator is served from the same cooler with 9,000 cu. ft. of air per min.

Turbine stop-valve steam conditions are 350 lb. per sq. in. and 825 deg. F. and the vacuum at the exhaust at the most

economical loading of 40,000 kW is designed to be 28.8 deg. hg. with circulating water at 62 deg. F. In the h.p. cylinder are twenty-five stages of expansion and in the l.p. cylinder sixteen followed by a duplex multi-exhaust stage. At loads in excess of 41,200 kW the first seven stages of the turbine are by-passed a governor. The greatest length of h.p. blading is 3½ in. and of l.p. blading 27½ in. with a maximum diameter over blading of 123½ in. There are two Michell thrust bearings. Labyrinth gland packings are employed for the h.p. and l.p. inlets, and water-paddle packing for the l.p. outlet. Steam is bled at four stages (two l.p. and two h.p.) and leaves the last "V"-tube heater at 310 deg. F.

An annular-flow condenser contains 6,700 1-in. tubes (more than 31 miles) providing a cooling surface of 43,000 sq. ft. and when full of water weighs 159 tons. Two 240-h.p., 590-r.p.m. pumps installed below the lowest level of the Manchester Ship Canal together deliver 1,830,000 gal. per hr. against a head of 33.5 ft. from the common circulating water system.

Two sets of 60 per cent. capacity three-stage air ejectors with individual capacities of 203 lb. of condenser vapour per hour and duplicate 100 per cent. capacity water extraction pumps driven by 78-h.p., 975-r.p.m. motors for withdrawing 750 gal. of condensate per min. each are installed.

As in the case of the older alternators which, however, are wound for 6.6 kV and connected direct to the terminals of the step-up transformers the switching is performed at 33 kV. Six new switch panels of cellular construction (as at present) and a horizontal air-core reactor have been accommodated by adding 40 ft. to No. 2 switch house. The rupturing capacity of the circuit breakers is 1,000,000 kVA.

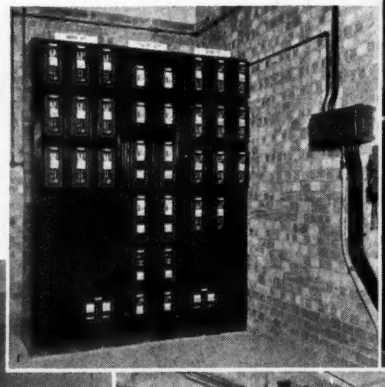
Half of the auxiliary motors (mostly made by Lancashire Dynamo & Crypto) are normally supplied from the house alternator and half from a 2,000-kVA, 33-kV/420-V, 2,000-kVA transformer connected to different sets of bus-bars of a 16-panel metal-clad switchboard. Direct-on starting is employed only for motors driving the alternator fans and extraction pumps.

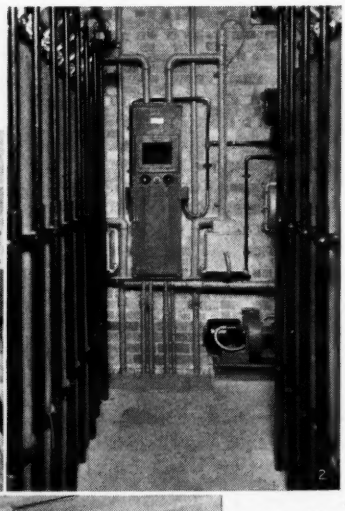
The extension was planned and supervised by Mr. H. C. Lamb, chief engineer and manager, and the engineering staff of the Manchester Electricity Department. Messrs. C. S. Allott & Son were responsible for the civil engineering work and the principal contractors were as follows: J. Gerrard & Sons, Ltd., buildings; E. Wood & Co., Ltd., steelwork; Simon Carves, Ltd., boiler plant; Metro-Vick Electrical Co., Ltd., turbo-alternator, condensing plant, evaporator, feed-water heaters, house-service transformer and 420-V switchgear; British Thomson-Houston Co., Ltd., 33-kV switchgear; Mather and Platt, Ltd., one electrically driven and one steam-driven feed pump; Harland Engineering Co., one electrically driven feed pump; Babcock & Wilcox, Ltd., high- and low-pressure pipework; Brightside F. & E. Co., low-pressure pipework.

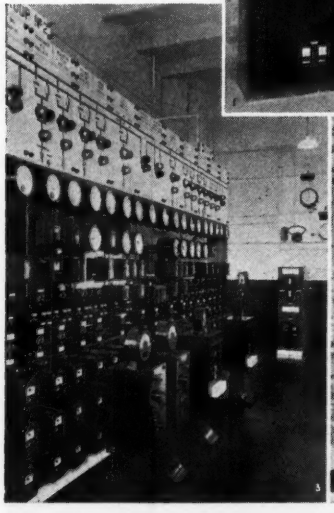
Switchgear Modifications at Willesden

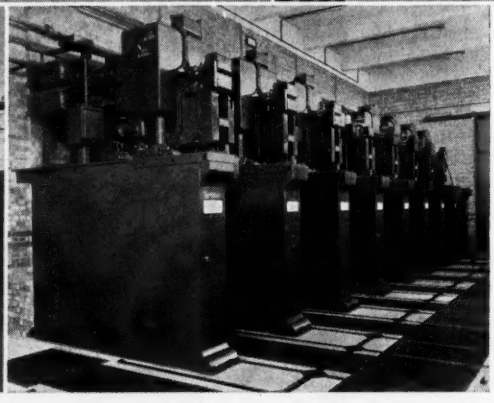
CONSIDERABLE modifications have been made recently to the main switchgear at the Willesden generating station of the North Metropolitan Electric Power Supply Co. These have involved the substitution of Reyrolle armour-clad 11-kV switchgear, with a rupturing capacity of 250,000 kVA, for the old cellular board (now removed) to which the company's feeders were connected, and the installation of further 33-kV switchgear to deal with the supply afforded by the Central Electricity Board. Originally the grid connection was by means of three 15,000-kVA, 33-kV feeders, controlled by G.E.C. armour-clad 750,000-kVA circuit-breakers, but last year the C.E.B. laid two further feeders each capable of transmitting 45,000 kVA, with provisional arrangements for doubling the amount.

For controlling this input and the associated output, a new switchhouse has been built on ground acquired for the purpose. In this building are housed two groups of Reyrolle 33-kV, 750,000-kVA switchgear housed in separate compartments and divided by section switches.









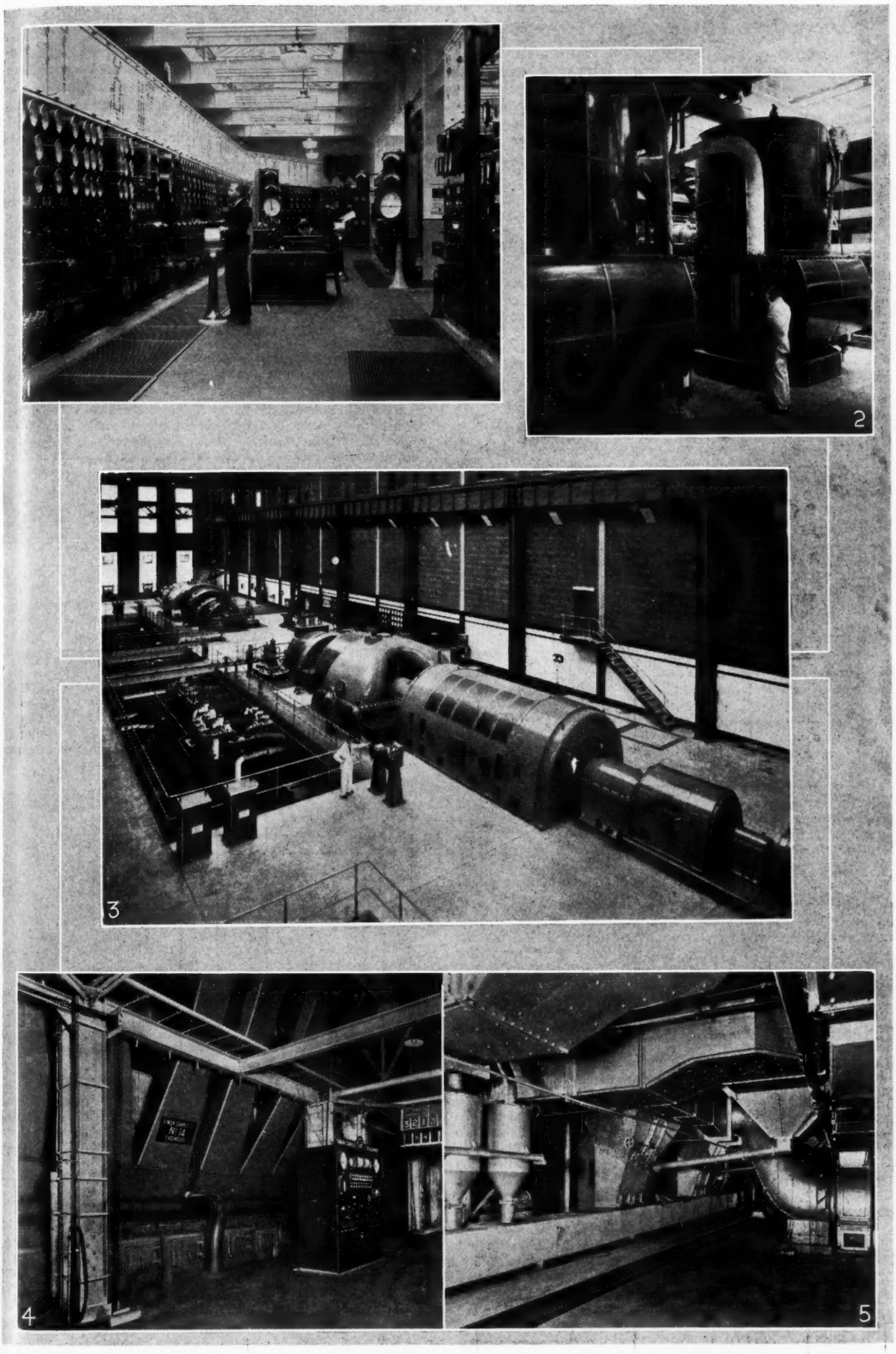
(1) Bus-zone protection relays. (2) Smoke detecting cabinet for cable tunnel. (3) Section of 33-kV control gear, with fire-fighting control board. (4) 33-kV armour-clad switchgear

The general scheme of 33-kV and 11-kV switching is that each falls into three groups interconnected by a star arrangement of reactors. These reactors are rated at 45,000 kVA with an impedance of 7½ per cent. for the 33-kV system and 7,500 and 3 per cent. for the 11-kV system. Each group of 33- and 11-kV switchgear is interconnected by a 15,000-kVA transformer fitted with on-load tap-changing apparatus. Circuits at both voltages can be changed over from one of the duplicate sets of bus-bars to the other without interrupting the supply.

In the construction of the new switchhouse, openings in the floor through which cables pass have been sealed with plastic material and the portions of cable above floor level up to the cable boxes have been surrounded with granite chippings to prevent damage from burning oil that may have escaped from the switch tanks. Oil falling to the floor is carried away through pebble-filled trenches to a sump.

Bus-zone protection (an independent system for each group) by the Reyrolle "Dualock" method has been fitted to the newest 33-kV switchgear and is also being applied to the earlier 33-kV panels. At the end of the switch-house is an unloading and repair shop where work can be carried out on circuit-breakers out of reach of danger due to maloperation of those in service. Current for switch-gear operation, indicating lamps on the control boards and emergency lighting is taken from a battery of 57 Chloride Planté cells of 432-Ah capacity on a ten-hour discharge which floats across the terminals of a continuously operated motor generator.

As a precaution against fire a CO_2 equipment is installed in the various sections of the building. This is brought into action by thermostats at frequent points or manually or upon the functioning of the bus-zone protection. The cable tunnel is similarly protected by remote operation from the control room, in which audible and visual indications of fires are given by means of light-sensitive cells. Congestion of the sub-soil due to cables and other underground works necessitated the construction of a tunnel from the new switch-house to the power station site at a point where the cables leave the ground and are carried on a bridge to the control room.



Sections of the Barton Power Station Extension (See page 673)

1. Main control room. 2. Raw water evaporators. 3. No. 2 turbine house; the 51,500-kW set is in the foreground and the 41,000-kW set in the background. 4. View of the front of No. 14 boiler, showing the twin-stokers and instrument panel. 5. The basement, showing the secondary air fan which delivers the high-pressure preheated air to the secondary air nozzles in the combustion chamber. The ash sluice is on the left.

Power Factor Improvement

By D. J. Bolton, M.Sc., M.I.E.E.

Prevention and cure

It may be more economical to neutralise magnetising currents than reduce them. This article seeks to show the limits to which expenditure upon condensers to improve power factor is justified

IN an article published in the ELECTRICAL REVIEW of April 29th (p. 609) I dealt with the cause of bad power factors, and in particular the magnetising current which is a necessary element in the operation of transformers and induction motors. An instance was given of an induction motor in which a saving of three or four pounds a year (on a kVA tariff) could be effected, at an additional first cost of about two pounds, by the simple expedient of installing a larger motor designed for a bigger voltage.

But although it may well pay to reduce the magnetising currents in this way, it may be even more economical to neutralise them entirely; since this is one of the cases where cure is often better than prevention. A complete cure for reactive magnetising current is reactive electrifying current. Suitable banks of static condensers or a suitably excited synchronous motor will therefore put the trouble right, and will prove an economic proposition whenever there are power factor penalties in the tariff.

The simplest case is where there is a bonus/penalty clause for power factors above or below a given figure, since there is a fairly constant relationship between power factor and reactive kVA per kW. In the example previously cited, that of the grid tariff for bulk supplies, there is a penalty amounting to approximately 15s. per annum per additional kVAR. Hence any condenser installation costing less than this figure per annum will be worth installing until the power factor has been raised to the datum figure of 0.85.

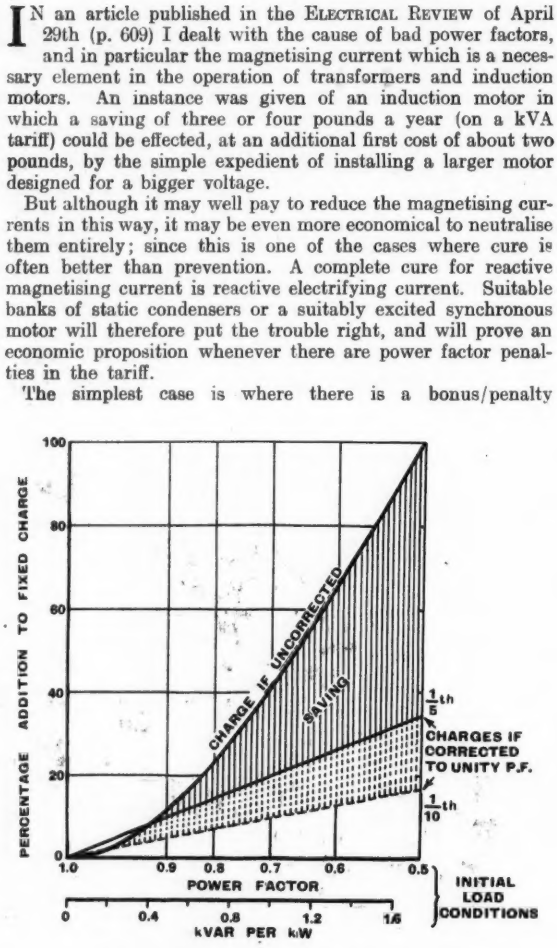


Fig. 1.—Correction to unity power factor

The commoner plan in retail tariffs is a fixed charge per total kVA, and this is less simple since the relationship is a variable one. The first thing is to find the ratio between the cost of the condensers per reactive kVA and the cost of the supply per total kVA. The two should be expressed on the same basis, either first costs or annual charges, and the ratio will commonly be of the order of 1/5th to 1/10th. The economic limit to power-factor improvement will then be reached when the sine of the angle of lag equals this ratio. This, which was first pointed out by the late Gisbert Kapp, follows directly from the rate-of-change relationship given in the previous article.

Figs. 1 and 2 illustrate the economics of the case, first when the power factor is improved to unity, and, secondly, when it is only brought up to the economic point. All the curves show the annual fixed charges incurred by lagging power-factor loads. The ordinates give the annual cost of the bad power factor, expressed as a percentage of the fixed charge on a unity power-factor load of the same magnitude. The base of fig. 1 represents the initial conditions, and it has two scales. One shows the initial power factor, and the other (which is evenly divided) shows the corresponding kVAR per kW. The upper curve gives the extra annual fixed cost of a two-part tariff in which the fixed charge is based on the total kVA of demand. It shows an addition to the fixed charge of 0 to 100 per cent. as the power factor falls from unity to 0.5.

The middle curve (labelled 1/5th) shows the annual costs of condensers if the power factor is raised to unity by this means. The assumption for this curve is that the annual charges on the phase-improvement plant (per reactive kVA) are one-fifth as much as the fixed charge of the tariff (per total lagging kVA). Thus, if the tariff is £4 per annum per kVA of demand, the condensers are presumed to cost 16s. per annum per kVAR, which is 40 per cent. on a capital cost of £2 per kVAR, *i.e.*, it would cover the first cost in 2½ years.

The lowest curve shows the condenser costs for a ratio of one-tenth, *i.e.*, for a £4 per kVA tariff the condensers must cost 8s. per annum, or 20 per cent. on a capital cost of £2 per kVAR. It will be appreciated that even this lower figure represents a much bigger percentage than is necessary to cover normal interest and depreciation at present-day costs. On the other hand, the figure has to cover the cost of losses (which have been neglected), housing, insurance, &c., of the extra plant, since the alternative (an increase in the supply bill) does not involve any such incidental expenses.

The shaded areas in the figure represent the saving effected by phase improvement when this is carried up to unity power factor. It will be seen that for any initial power factor, say 0.7, the extra fixed charges before improvement amount to 43 per cent. of the basic fixed charge, whereas after improvement to unity they are only 20 or 10 per cent.

There is a further point that can be shown by this type of curve. Fig. 2 shows the same graph re-drawn for the one case only (ratio 1/5th). As before, the base represents the initial conditions, but in this case it is evenly divided in angles of lag so as to enlarge the high power factor end. Consider any example such as that in which the initial power factor is 60 per cent. and represented by the vertical line *AE*. If uncorrected, the extra fixed charge at this power factor is represented by the height *AE* as a percentage of the fixed charge at unity power factor. If corrected to unity, the fixed charge becomes *AD* (paying for the condensers), giving a saving of *DE*. But suppose the power factor is corrected, not to unity but to 98 per cent. The extra fixed charge of the tariff is now reduced not to zero but to $A'B' = AB$. The fixed charge on condensers necessary to do this is now represented by *AD* minus $A'C' = CD$. Thus the total fixed charge due to an initial power factor of 0.7 is now given by *AB* (for tariff) plus *CD* (for condensers), *i.e.*, by the two bracketed portions.

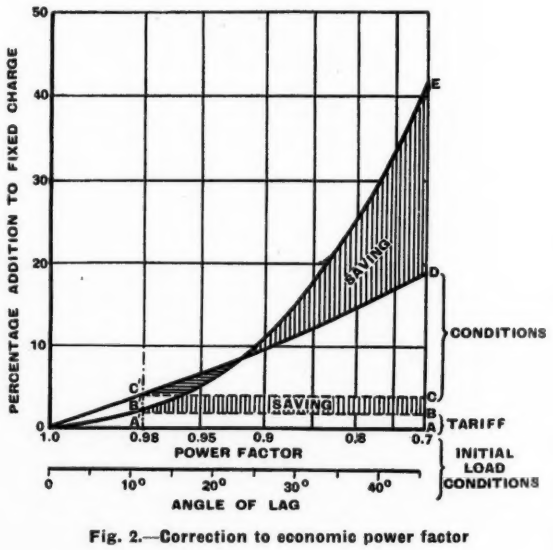


Fig. 2.—Correction to economic power factor

Moreover, whatever the initial power factor, provided it lies to the right of $A'C'$ there will always be some net saving in improving the power factor up to 0.98, namely, the sum of the two shaded areas. It will be seen that the upper shaded area becomes negative after about 0.92 and must be subtracted from the other and that the position of the economic p.f. (in this case 0.98) will depend on the ratio of the annual charges on tariff and condensers. When this ratio is 1/10th it will occur at 0.99.

Portable Electric Tools. By C. E. Luxton

Comparative performance tests with high-frequency and compressed-air machines show the former to be much superior in the speed with which work is executed and cost of operation

OWING to the introduction of high-frequency electric motors portable electric tools can now deal efficiently with many operations which a few years ago would have been considered far beyond their capacity. The extent of the departure from conventional designs can be appreciated from a brief survey of older types of motor. These machines can be divided into the following categories :—

(*a*) Compound-wound d.c motors providing speed regulation within certain limits were particularly popular in shipyards as they were robust and powerful, but the gradual change-over to a.c. has considerably limited their use.

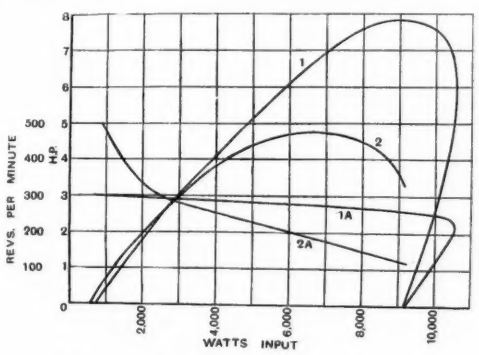
(*b*) Series-wound d.c. motors, despite a drop in speed under load, were also popular in shipyards.

(*c*) Universal motors are now widely used, especially since the change-over to a.c.; the high armature speed offers certain advantages on small tools, but as it falls by 50 per cent. under load it is hardly desirable on production work where a constant speed of working is essential.

(*d*) 50-cycle, three-phase a.c. induction motors are the most robust type owing to absence of wound armature; they give a close speed control, but a low rotor speed of 3,000 r.p.m. prevents their application to small tools owing to their low power output per lb. weight as compared with d.c. and universal motors. By increasing the speed of the three-phase motor the essential characteristics of a good portable tool would be obtained. Designers have therefore raised the frequency from 50 to 200 cycles, which gives a synchronous speed of 12,000 r.p.m. with a two-pole motor, or approximately 10,800 r.p.m. under loaded conditions. This compares with the 8,000 to 16,000 r.p.m. obtainable with d.c. and universal motors, but whereas the full-load speed of the latter is only half the synchronous, the speed of the induction motor does not go below about 10,800 r.p.m.

Advantages of H.F. Operation

Briefly summarised, the use of high frequency gives less weight due to increase in power per lb. weight of machine—relatively small speed variation from no load to full load, and



Curve 1: B.h.p. of high-frequency reamer.
Curve 2: B.h.p. of d.c. reamer.
Curve 1A: Speed of high-frequency reamer.
Curve 2A: Speed of d.c. reamer.

Comparison of high-frequency and d.c. reamers

superior reliability owing to absence of armature windings, commutator and brush gear.

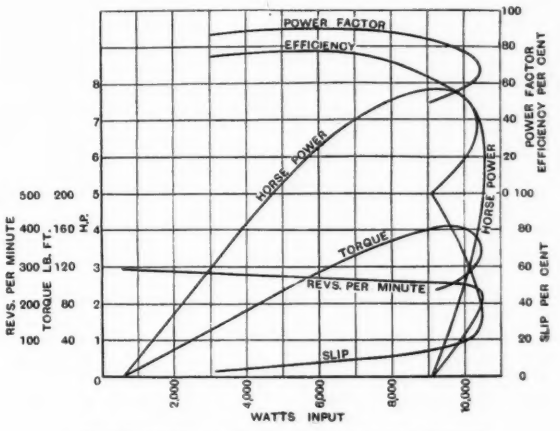
Comparative particulars of high-frequency and d.c. reamers are given in the following table:—

	H.f.	D.c.
Weight lb.	50	68
Input watts (nominal)	5,300	3,600
Horse-power output	5.35	3.5
Spindle speed, r.p.m.	280	265
Slip per cent.	6½	56½

The armature, exclusive of shaft, of a d.c. machine weighs 2½ times as much as the rotor of the high-frequency tool. The latter has a slip of only 15 per cent. at maximum h.p. and torque. This close speed regulation has made high-frequency tools particularly suitable for grinding wheels where constant speed is necessary to obtain maximum efficiency. Correct cutting speeds for any classes of work can be obtained by gearing. The speed of a geared grinder, driven by a universal motor with an armature speed three times that of the spindle, was found to drop from 5,200 r.p.m. at the spindle at no load to 2,000 r.p.m. at maximum load.

Compressed-air grinders also lack the close speed control which is essential. The curve of a performance of a reciprocating piston type of pneumatic grinder shows that the range of maximum power is from 1,400 to 2,200 r.p.m., while the no-load speed is 4,000. The rotary pneumatic grinder has a load speed of from 3,000 to 3,600 r.p.m., which is an improvement over No. 1, but the no-load speed is 6,800 r.p.m., which is excessive for a 6-in. wheel.

A rotary pneumatic grinder with a governor has its no-load speed held down by throttling the air, not only making it a safer tool but reducing air consumption at lighter loads. The speed of the high-frequency grinder is held within close limits and there is plenty of power to handle the work. Furthermore, although



Characteristics of large high-frequency reamer

not shown, the power consumption, as of all electric motors, is less at the lighter loads, which is not true of the pneumatic tools except in the case of the governed rotary unit.

Wide Application

The high-frequency principle is applied to portable tools of all types, including drilling machines, screwdrivers, nut runners, tappers, grinders, sanders and polishers, &c. Drilling machines range from small sizes for drilling holes of ⅛ in. and $\frac{3}{16}$ in. dia. on aircraft construction to large shipyard tools capable of drilling holes of 1¼ in. and 2 in. dia. An example of the former is a $\frac{3}{16}$ in. drill running at 2,000 or 3,000 r.p.m., weighing 4¾ lb. and developing 0.15 h.p. at normal load or 0.201 h.p. at peak load.

Representative of the larger type is a shipyard drill having spindle speeds from 165 to 450 r.p.m., which drills holes up to 2 in. diameter, weighs 42 lb., develops 2.62 h.p. at normal load and 4.7 h.p. at peak load. The designs of shipyard drilling machines follow very closely those of compressed-air tools, inasmuch as overall length is kept to a minimum by the offset spindle and feed post built in line with the feed screw ejecting the twist drill.

Nut runners have an interesting clutch construction. Two sets of jaws are provided, the upper set being the positive driving jaws which are engaged when the pressure is applied to the back of the machine while the slipping takes place on the lower jaws which are very shallow. The tension on the lower jaws is adjustable by means of the nut and spring shown. These tools are built in various sizes to deal with nuts of from $\frac{3}{16}$ in. to 1¼ in. (bolt diameters).

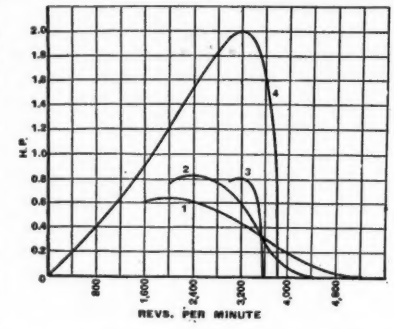
Grinders are designed to give, by means of gearing, spindle speeds equivalent to cutting speeds of 6,000 and 9,000 ft. per min. These are 6,000 and 8,000 r.p.m. for the 4-in. size, 3,750 and 5,400 r.p.m. for the 6 in., and 2,840 and 4,300 r.p.m. for the 8 in. The fullest service is obtainable from the wheels at their correct speeds by first using an 8-in. wheel on an 8-in. grinder, transferring it to the 6-in. machine when it wears down to this diameter, and finally to the 4-in. grinder. Previously an 8-in. or 6-in. wheel was often used on the same machine until it wore down to 3 in. or so, with resulting loss of efficiency.

Performance Compared

The advantages of high-frequency tools over other types of portable tools in performance can be illustrated by a few examples taken at random. A large high-frequency drill made 1 in. holes in oil tank hatches ⅜ in. thick at the rate of 260 per hr. compared with 192 per hr. with a d.c. drill. On another job a high-frequency drill weighing 33 lb. drilled 1¼ in. dia.

holes through 2-in. plate in 15 sec. each compared with 35 sec. each by a d.c. machine weighing 40 lb.

In comparison with compressed-air tools the higher overall efficiency of an electrical system is emphasised. Compressed air as a medium of power is very convenient and safe, but cannot be claimed as efficient even under the most favourable circumstances. A rather rough guide is to take the power consumption of a high-frequency and a compressed-air tool. It requires approximately 1 h.p. to compress 5 cu. ft. of free air to 100 lb. per sq. in. A drilling machine of 1¼in. capacity consumes about 45 cu. ft. of air per min., which is equivalent to 9 h.p. On the other hand, a similar high-frequency tool requires only 3 h.p.



Comparison of electric grinders of four different types, all of the same weight

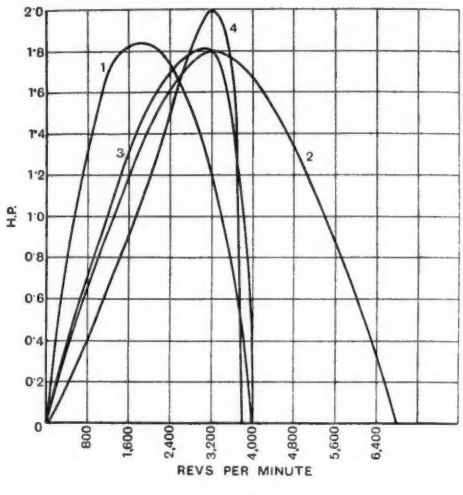
Curve 1: Geared universal - motor grinder.
Curve 2: Geared compound - wound d.c. grinder.
Curve 3: Gearless 60-cycle induction-motor grinder.
Curve 4: Geared high - frequency grinder.

With a high-frequency drill the reaming of 2,066 ¾ in. dia. holes took 18 hr. and countersinking 18½ hr., making a total of 36½ hr., whereas an air drill required 28½ and 28 hr. for the same work, totalling 56½ hr., the saving in time being thus 36 per cent. Twelve air drills absorbed all the output of a compressor driven by a 130-h.p. motor, while twelve high-frequency machines absorbed the output of a 45-h.p. frequency changer, saving 65½ per cent. in power. Performance figures, of course, vary with conditions and those given above are taken at random from many available.

Grinding by high-frequency tools has been given very close attention during the last year or two. Compressed air grinders have always been favoured for heavy grinding by reason of their robust construction, but the sharp drop in speed on the application of pressure detracts from the efficiency of the wheels which are intended to run at fixed cutting speeds. A comparative working test on manganese castings showed that the work was done by a high-frequency grinder in 46 min. and by air in 56 min. with a wheel wear of $\frac{3}{16}$ in. in the first case and $1\frac{1}{16}$ in. in the other. The consumption of electricity was 6.25 kWh costing, at 0.8d. per kWh, 5d., and of air 45 cu. ft. per min. costing, at 6d. per 1,000 cu. ft., 1s. 3½d.

Again, six high-frequency grinding wheels, 8 in. by 1½ in., required one new wheel per machine per week at 15s. 2d. each, giving an annual cost (50 weeks) of £228, whereas the same number of similar compressed air units called for 2½ wheels per machine every week costing approximately £569 per annum. The cost of electricity per annum (50 weeks of 48 hr.) with 20-kW input at ¼d. per kWh was £100., and compressed air (240 cu. ft. per min. free air=44 kW input) worked out at £220. The saving for twelve months was therefore £789–£328=£461.

It is not the intention to prove the inefficiency of the compressed-air system but rather to show that the development of the high-frequency tool takes us a step nearer to obtaining the ideal portable tool. Many shipyards, railway shops, steel-works and foundries and, with scarcely an exception, all well-known motor-car manufacturers, have taken advantage of the system with highly satisfactory results.



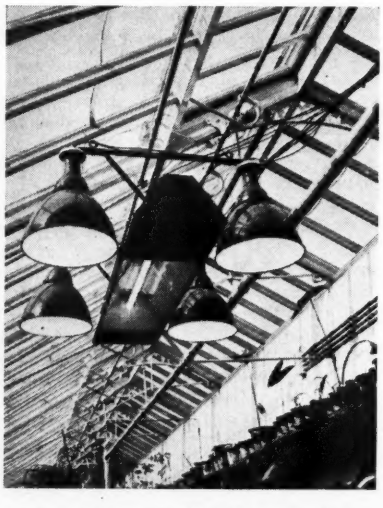
Curve 1: Reciprocating pneumatic grinder.
Curve 2: Rotary pneumatic grinder.
Curve 3: Rotary pneumatic grinder with governor.
Curve 4: Geared high-frequency grinder, same as in fig. 3.

Comparison of pneumatic grinders with high-frequency electric grinder

Plant Irradiation

DURING the past winter experiments were carried out at the Royal Botanic Gardens, Kew, with a G.E.C. plant irradiator to obtain data on the possibility of counteracting the deficiency of light during short winter days, particularly on the frequent occasions when fog is prevalent.

It has been established from experiments carried out elsewhere that plants respond particularly to light from the red end of the spectrum, resulting in a stimulation of earlier flowering and increased carbon assimilation, while the green colour of the foliage was improved. In this experiment it was desired to augment the red irradiation with blue-green light, to obtain a closer approximation to the daylight spectrum. Consequently, a special irradiator was designed incorporating a red "Osira" flood-lighting lamp in combination with four standard high-pressure mercury electric-discharge lamps.



The G.E.C. plant irradiator with which experiments have been carried out in Kew Gardens

Although the experiments were in progress only a short time, some interesting information was obtained and it was found that, with certain kinds of begonias, by increasing the length of day to 12 hr. during the winter months the flowers opened earlier and flowering continued for a longer period under irradiation than would otherwise have been the case.

In another house, with no artificial light, the flowers of some of the begonias never opened fully during the winter months, although there was some improvement after the days lengthened at the beginning of the new year. *Euphorbia fulgens* came into flower earlier in the season when irradiated, but finished rather sooner than the unlighted specimens in the same house. The irradiated specimens of this plant put out vigorous young shoots, when the untreated ones did not. It is interesting to note that the irradiated begonias differed from *euphorbia fulgens* in remaining in flower for as long as the untreated ones, although they had commenced to flower earlier in the season. With *coleus frederici* irradiation caused a slight increase in the number of flowers which opened and the amount of seed "set," but the effect was not very marked. To obtain good results with this species, it was found necessary to maintain a high temperature and to ensure that toxic substances, such as may be introduced by fog, were excluded from the house as far as possible. Cinerarias were induced to flower appreciably earlier in the season by irradiation.

It was observed that all the plants remained very healthy in general appearance under the irradiator, and the colours of the flowers were remarkably natural while being treated with the combined red and blue-green light, which overcame the unsightly appearance of flowers being treated under red light only. This may not be deemed important as a rule, but where flowers are exhibited for inspection by the public, it is a factor worthy of consideration. Red irradiation alone produced a similar effect to that with the combined light, but, of course, the appearance of the plants was affected while the light was in use.

Economic Cable Sections

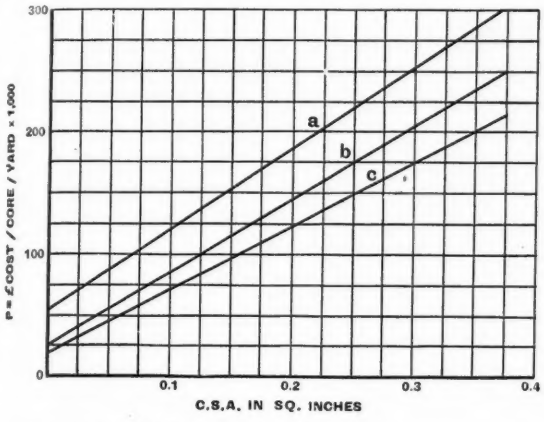
By J. H. Sumner, M.Sc.Tech., A.M.I.E.E.

Choosing a cable with regard to voltage regulation and temperature rise

While agreeing that the considerations affecting the choice of cable sizes are both many and varied, the author feels that wherever possible the "economic" section should be the dominant factor and should provide the basis on which other more general requirements are considered

THE cross-sectional area of a cable is determined by two main physical factors—the permissible current density for a specified safe temperature rise, and the permissible voltage drop over a given route length. Usually, the design of low-voltage cable networks is determined largely by the second item.

While the main outgoing feeds which are taken from the sub-station must be of sufficient section to carry the anticipated maximum loading without overheating, generally speaking voltage regulation is the dominant factor. Theoretically the voltage drop in a distributor may be calculated exactly, but in practice the loading of a distributor is rarely known accurately and an estimate must be made of the voltage drop based on an assumed loading. A knowledge of local conditions and practical experience of such work is essential to sound design and the ability to forecast future load development and interconnection of the network to serve it is almost equally important.



(a) P=0.667A+0.055 (3 core, 11 kV, p.i.l.s.s.w.a.).
(b) P=0.595A+0.027 (3 core, 3 kV, p.i.l.s.s.w.a.).
(c) P=0.507A+0.020 (4 core, 400 V, p.i.l.s.s.t.a.).

Fig. 1.—Cost factor for various types of underground cables

When we turn, however, to high-voltage transmission cables the problem takes on rather a different aspect. It will be usually found that over the route lengths obtaining in practice the requirements of voltage regulation make it impossible to run the cable at the maximum current density permissible on grounds of safe temperature rise. We are therefore left to decide whether to put in the smallest size of cable which will give the required voltage regulation or whether to install a larger one and by this means keep down the losses in the cable.

Kelvin's Law

If we assume that a given load is to be supplied at the far end of the cable and that any cable losses are to be made up at the "sending" or "generating" end, then Kelvin's Law will enable us to calculate the most economical section with mathematical exactitude. Alternatively, the annual cost of the losses may be calculated for several different sections, and added to the interest and depreciation charges to the cables' first cost. The section can then be chosen which gives a minimum total charge.

It is useful, however, to attempt a more general survey of the method of economic choice to see if it is possible to avoid working out each case from first principles. What the engineer usually requires is an approximate idea of the economic section so that it can be rapidly compared with the requirements of heating, voltage regulation and general system operation.

In practice the basic data such as load factor, price of energy, price of cable, are all liable to slight variation and the calculation of the exact economic section is thereby rendered difficult and, to a certain extent, unnecessary.

Accordingly, Kelvin's Law may be stated as follows: "The most economical section to employ is that which makes the annual cost of the energy wasted in the cable equal to the annual charge (interest and depreciation) on that portion of the first cost of the cable which varies with cross-sectional area."

As an example of this method of calculation it is proposed to consider the case of an 11-kV three-core cable, energy being purchased at £3 7s. 6d. per kW per annum, plus 0.23d. per kWh. Fig. 1 gives typical cable prices and indicates that the cost follows a straight line law when plotted against cross-section of the conductor. Suppose, therefore, that we assume the following quantities:—$\alpha A+\beta$=cost per unit length per core where α and β are constants, A=cross-sectional area of conductor in sq. in., I=full-load line current, ρ=resistivity of conductor material, τ=combined rate of interest plus depreciation (on unity) for the first cost of the cable, F=percentage load factor during connection, C=percentage hours of connection, $(0.3F+0.7F^2)$=load factor of losses in cable, and ($£q$ per kW per annum $+p$ pence per kWh)=price of energy.

By adding together the annual charges on the cable's first cost and the annual cost of the losses, and differentiating with respect to A it may be shown that the economic current density:—

$$I/A = \sqrt{\frac{\alpha\tau}{\cdot 0365 p\rho C(0.3F+0.7F^2)+p\rho 10^{-3}}}.$$

From fig. 1 α=0.667, and we assume ρ=0.678 microhms per inch cube, q=£3 7s. 6d. per kW per annum, and p=0.23d. per kWh.

If we stipulate a twenty-year life with interest at 5 per cent. on first cost and 3¼ per cent. on sinking fund deposits, then: τ=0.0847 and the expression is reduced to:—

$$I/A = 6{,}400 \sqrt{\frac{0.0565}{3.375+[36.5(0.3F+0.7F^2)]\,0.23C}}.$$

Taking a life of thirty years instead of twenty, would have reduced the current density by rather more than 10 per cent. This expression is independent of the actual magnitude of the load and of the route length of cable, the value of I/A being determined solely by the load factor, the price of energy, and the value of α and τ.

Economic current density is plotted in fig. 2 and various values of C and F, the load factor F being scaled logarithmically along the base. Having once drawn such a set of graphs for a given value of α and τ, it is an easy matter to allow for variations in either α or τ, since the current density is proportional to $\sqrt{\alpha\tau}$, *i.e.*, if either α or τ were doubled the current density would be increased by 41.4 per cent. It is a simple matter to plot the cable prices existing at any particular time and so determine the value of α, and having done this the economic current density may be read off from the appropriate graph and adjusted for any variation in the basic value of α.

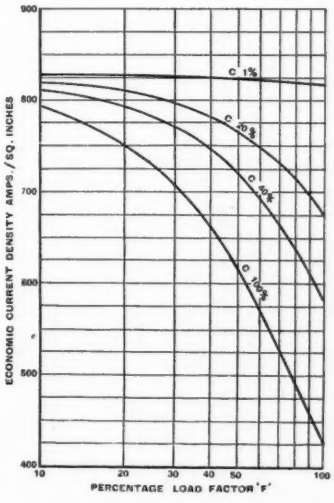


Fig. 2.—Economic current densities for 11-kV underground cables in terms of load factor

In a large undertaking the price of energy may also have to be considered as a variable, since at distant parts of the system the transmission costs must be added to the bulk supply or generation costs. It would therefore be useful to take the curve for C=100 per cent. in fig. 2 and plot it for two or three different tariffs, representing the approximate cost of energy at different parts of the network. Here, again, once this is done, much laborious calculation is avoided when considering individual problems in the future.

To demonstrate the utility of the method let us compare it with the requirements of voltage drop and temperature rise. Table 1 shows the current densities permissible on grounds

TABLE I.

Maximum permissible current densities for 11 kV. cables (B.S.S. No. 7) laid direct in ground and armoured. Temperature of soil taken as 15° C. Maximum permissible temperature of conductor and dielectric taken as 65° C. for continuous loading.

C.S.A. sq. in.	Permissible Density amps./sq. in.
0.04	2880
0.06	2420
0.075	2220
0.10	1950
0.20	1425
0.25	1290

of temperature rise for armoured cable laid direct, and it is obvious that in all cases the economic method will indicate a density well below the safe limit.

The next point to consider is the permissible voltage drop which is likely to be encountered, for which a figure of 5 per cent. has been assumed. Fig. 3 shows typical impedance values of 11-kV three-core cables and from this we can construct the curve R_t. in fig. 4, giving the cross-sectional area required for any particular load for a route length of 20,000 yd. and 5 per cent. voltage drop.

If we next assume continuous connection of the cable $C=100$ per cent., and a load factor $F=40$ per cent., then fig. 2 gives the economic current density as 660 A per sq. in. and we can draw the line E_t. in fig. 4 indicating the economic size

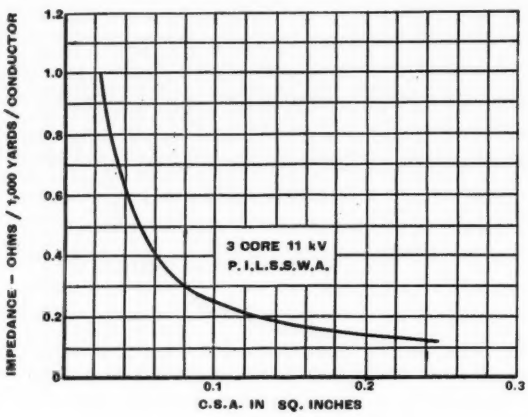


Fig. 3.—Impedance of typical 11-kV cables

of cable to install for a given load. Notice that E_t. and R_t. almost coincide up to 0.10 sq. in. and 1,000 kW at 20,000 yd., so that for these conditions economic choice is possible, and almost identical with our assumed voltage drop requirements.

For route lengths of *less* than 20,000 yd., however, consideration of voltage drop alone would indicate a smaller section than the economic one, and therefore the economic section should be chosen in preference. Similarly if 10 per cent. voltage drop is allowed, for the sections under consideration, the curve R_t. would always be below the line E_t. at 20,000 yd. and would cross it at about 32,000 yd. with 2,500 kW and 0.25 sq. in. section.

The two main aspects of the problem, economic section and permissible voltage drop, may be conveniently combined in a chart constructed in the manner of fig. 5. For a given load on the right hand scale look left to the appropriate economic choice line and read off below the economic cross-sectional area of conductor. Reading next vertically up from this value the points of intersection with the dotted curves will give the resultant voltage drop for various route lengths from 5,000 to 40,000 yd., as indicated by the left-hand scale.

Consideration of voltage regulation alone will usually

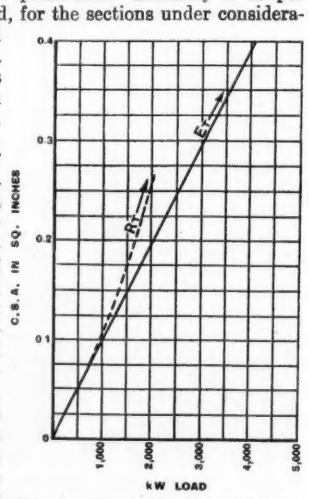


Fig. 4.—Economic size of 11-kV cables in terms of load

Power factor = 80%. Load factor = 40%. Rt = 5% voltage drop, 20,000 yards route length terminal loading. Et = Economic choice with terminal loading.

lead to the choice of too small a conductor. The "economic" section provides a sounder basis for design and the resultant current density will be well below the safe limit for the cable.

The graphical method indicated avoids the necessity for working out the cost of the losses for each particular set of conditions and is accurate enough for engineering purposes, while it may also be extended to indicate approximate voltage drop as in fig. 5.

Having ascertained these two vital points, the engineer may then proceed to consider other factors affecting his choice, such as probable load development, interconnection of the proposed cable with the existing system and the possibility of operation in parallel with other feeders, &c. The effect on the economic section of varying interest rates, life of cable, and price of cable, will only be slight and it may quite easily be adjusted on the lines already indicated.

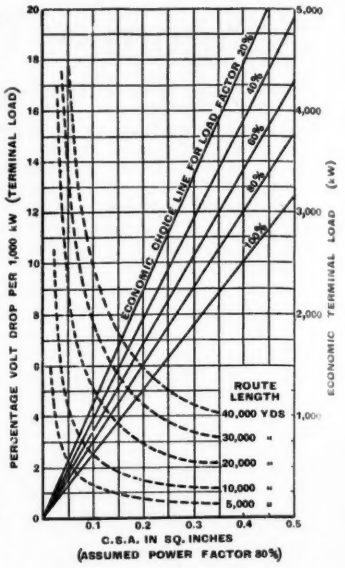


Fig. 5.—Economic section chart for three-core 11-kV cables

Canadian Water Power Resources

THE latest annual inventory of the developed and undeveloped water-power resources of Canada published by the Dominion Water and Power Bureau of the Department of Mines and Resources, Ottawa, gives the available water power as 20,347,400 h.p. under conditions of ordinary minimum flow and 33,617,000 h.p. ordinarily available for six months of the year. These are minimum figures, as there are many unrecorded rapids and falls and also rivers and streams on which economic heads may be created by the construction of dams. The estimates are calculated on the basis of 24-hr. power at 80 per cent. efficiency. The ordinary minimum flow is taken on the averages of the flows for the two lowest periods of seven consecutive days in each year, over the period for which records are available, and the ordinary six months' flow is upon the continuous power indicated by the flow for six months in the year.

An analysis of the water-power plants concerning which complete data are available as to turbine installation and satisfactory information as to stream flow shows the average machine installation to be 30 per cent. greater than the ordinary six months flow power, thus the present recorded water-power resources of the Dominion will permit of a turbine installation of about 43,700,000 h.p. The present turbine installation of 8,112,751 h.p., therefore, indicates the development of a little less than 19 per cent. of the recorded water-power resources of Canada.

Approximately 60 per cent. of the total available water resources and more than 81 per cent. of the developed water power are in the highly industrialised provinces of Ontario and Quebec, in which there are no known natural coal deposits. In Quebec a remarkable development has been achieved, the present installation representing about half of the total for the whole of Canada.

Central electric stations, which generate electricity for general distribution for domestic, municipal, commercial and industrial use, maintain a total installation of 7,074,641 h.p., or 87.2 per cent. of Canada's total hydraulic installation. Nearly 7 per cent. of their output is sold for export to the United States. The average revenue per kWh for all water power produced is only 0.50 cent (1.91 cents for electricity sold for domestic and farm use).

During 1937 Canadian consumption of electricity produced in central electric stations was 25,728 million kWh, about 99 per cent. of which was produced by hydro-electric power plants.

It is conservatively estimated that the present 8,112,751 h.p. of developed water power represents a total investment of $1,640 million.

Horizontal Street Lanterns

By R. Maxted, B.E., A.M.I.E.E.

In dealing with the provision of good street lighting in accordance with the Departmental Committee's Report the author makes special reference to cut-off control

TWO years ago the author expressed the opinion* that horizontally operated high-pressure mercury-vapour lamps would prove an important factor in street lighting and floodlighting. The horizontal-line source was then already firmly established in floodlighting, and following the success of the horizontal "Mercra" floodlantern described in 1934,† projectors using horizontal-line filament lamps were developed. Last year street-lighting history was marked by two major developments. In September was published the Final Report of the Departmental Committee on Street Lighting. Almost coincidentally, the A.P.L.E. Conference at Folkestone brought forth an interesting number of street-lighting installations using horizontal discharge lamps.

Since the first horizontal street lantern in 1934, street lighting technique has developed to a point where good street visibility is no longer a fortuitous occurrence. It is a result to be designed for and achieved with, perhaps, little more disappointment than is experienced in quite well-established branches of engineering. While economic limitations are often felt, unsuitable road and pavement surfaces provide the greatest stumbling blocks to-day. Many road surfaces lack suitable light-reflecting properties—a light colour is not essential—and other streets lack natural contrasts at, for example, the kerb line, and present a flat picture even by day. With many existing streets there is, unfortunately, little immediate prospect of assistance from the road engineer.

If the lighting engineer is to solve these difficult cases unaided, he will probably have more recourse in the future to the more expensive close-spaced, low cut-off type of installation. This would mean about 16,000 lumens per 100 ft. as compared with the 3,000 to 8,000 lumens now recommended in the M.O.T. Final Report. The cut-off also implies a still further application of horizontal discharge lamps.

Given suitable street surfaces and contrasts, however, it is possible to promise good visibility with reasonable economy in the type of installation indicated by the M.O.T. Report. It is, therefore, significant that the horizontal street lantern should assume such prominence at a time when a clearer conception of the problem is abroad, and the engineer is achieving no small measure of success in the street-lighting field.

It is the purpose of this article to examine the principles of good modern practice in so far as they affect lantern design, and to show that the horizontally operated lamp is not in itself the end, but must be mated to a suitable optical design of lantern.

Modern Installation Design

Wherever good visibility is found, the outward and visible design is usually a line of special lanterns on each side of the road, mounted not less than 25 ft. high, and spaced not more than 300 ft. in each line—that is 150 ft. staggered spacing. This is the view expressed in the M.O.T. Report, and is the main burden of the recommendations on installation design in the case of straight roads.

A closer study of successful installations, and of the Report, reveals that there is some intricacy in choosing the positions of the lanterns. When the straight and uncrossed road is left behind, the only regular features of the installation are the lantern and the mounting height. From this it appears that the new visibility was not won only by using new lamps for old, or even by more extravagant lighting schemes alone. The fact is that for about five years lighting engineers have carried out fundamental research work and have, in the place of a few simple rules, a new creed.

The new order requires that the whole of the highway and its complications for hundreds of yards ahead shall be readily visible to a driver. More exacting still, in the ideal condition aimed at, the road surface should appear brighter than any object upon it. By this means objects are seen well ahead as dark silhouettes against the bright road surface, as in fig. 1. This is the general strategy underlying the recommendations of the M.O.T. Report, and the advantages are obvious in revealing black-coated pedestrians on a dark-coloured road surface. Light-coloured objects should also be seen as dark silhouettes, and this condition implies a brighter road surface than at first appears possible, even with concrete surfaces. Fortunately, many road surfaces have the degree of polish necessary.

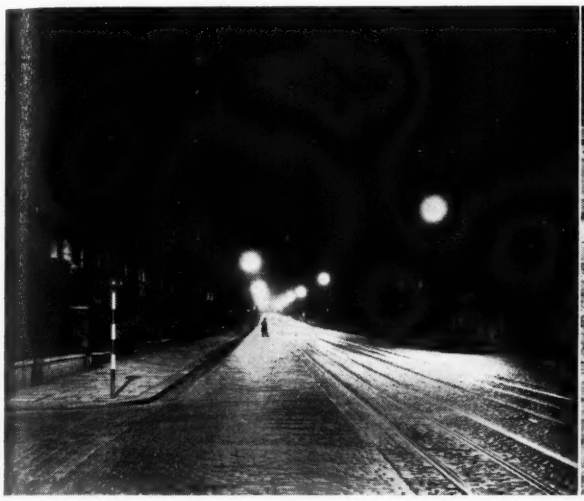


Fig. 1

Fig. 2

Basic Principles

In order to appreciate the need for certain types of lantern light distributions, it is necessary briefly to consider the tactics of the silhouette method, and to see what is required of the lantern. When light is projected along a road for some distance towards an observer, he sees a bright lane on the road surface lying between him and the lantern. The centre of this bright lane always lies on a straight line joining the observer to the lantern site, and this is demonstrated by the lines in fig. 2. As the observer moves, so the lane of light moves to obey this law. The position of the bright lane is, therefore, determined by the relative positions of the observer and the lantern. As the path of a driver is usually well defined, it is evident that the lantern must be suitably sited if the bright area is to lie on a useful part of the road surface. To render the whole road surface bright, a number of lanterns must be placed so that the bright streaks join up, and continue to coalesce as the observer drives towards them. Once these fundamentals are mastered the planning of an installation calls for first-hand experience of traffic conditions, and often for great patience. The "location of units" therefore emerges as part science and part art, and is not generally reducible to rule-of-thumb methods except on straight, uninterrupted roads, and perhaps at orthodox right-angle intersections.

Thus the range of directions over which a lantern will be approached, and is required to present the maximum candle power, is a matter of experience in planning. It becomes obvious too, that there is a complex relationship between lantern, road surface, object and observer. The road surface must be made bright, but the object upon it must be kept dark

* ELECTRICAL REVIEW, Feb. 28th, 1936.

† ELECTRICAL REVIEW, July 27th, 1934.

to enhance the contrast. Light must be projected *toward* the observer to achieve this, but the same light may cause glare and reduce his ability to see. The optical design of the lantern is obviously of the greatest importance and must be based upon a careful study of these factors.

The complete installation design has, then, two main aspects,

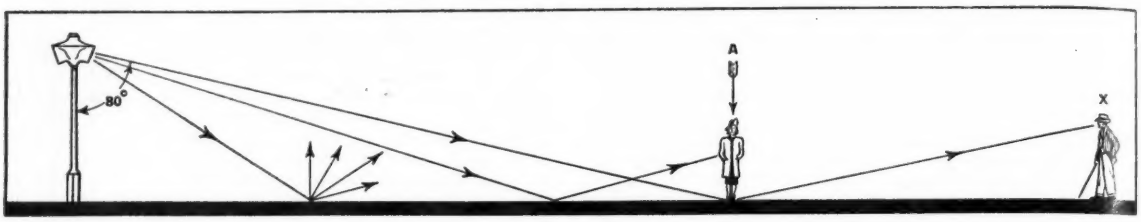


Fig. 3

the design of lanterns and the location of lanterns. While it is natural to consider the street-lighting problem under these sub-divisions, it should be realised that the two aspects cannot be dealt with separately. Consideration of the lantern characteristics required will show how closely linked these are to certain features of the installation layout, and it will be seen that the more specially fitted a lantern is to meet installation requirements, the more vital it becomes to adhere to the specified spacings and mounting heights.

Making the Road Surface Bright

The first problem in fixing a lantern distribution is to ensure that the dark road surface usually encountered will be brighter than the objects upon it, thus providing sharp silhouette vision. A characteristic of the road surface which makes this possible is illustrated in figs. 3 and 4, which show that light striking the surface at glancing angles is reflected mainly in directions away from the lantern. The road surface acts like a rough mirror, and the lane of light seen by the observer is really a spread and distorted image of the lantern. The important point, however, is that light projected at angles near to the horizontal—and striking the road surface at very glancing angles—is most efficiently reflected. Fig. 4 shows that, with this spread-specular reflection, the road brightness may far exceed the brightness of even a diffuse white object on the surface. Sharp silhouette vision may, therefore, be provided by the modern installation with lanterns projecting high intensities to within a few degrees of the horizontal, and with a lantern spacing of 150 ft.

With a lantern cut-off at 70 to 75 deg. this phenomenon is not much exploited, and the general effect is a reduction of surface brightness (fig. 4) and an increase of object brightness due to the closer lantern spacing required. Thus the contrast between object and surface is reduced as the cut-off is lowered, and the general level of brightness depends less upon road polish and more upon the colour of the surface. With the quantities of light commonly used with a low cut-off, surface brightnesses are often uncomfortably low; and while a low cut-off means little or no glare, the whole effect may be spoilt by the glare from extraneous sources such as a car side-lamp.

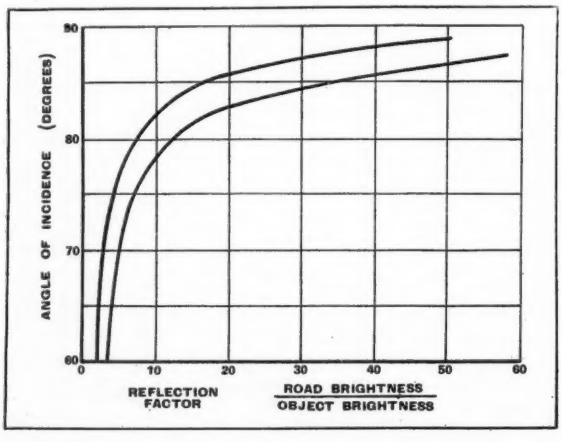


Fig. 4

Recent experience indicates that on the dark surfaces most commonly found a very satisfactory result may be obtained with a 70 to 75 deg. cut-off using a light output of 10,000 to 20,000 lumens per 100 ft. length of road. With a cut-off raised to 86 deg. and a wider spacing of units the same surface may be satisfactorily treated with 6,000 to 8,000 lumens per 100 ft. Having regard to the economics of the problem and to the prevalence of dark road surfaces the moral of fig. 4 is that light should be projected at high angles.

In seeking a high brightness on dark surfaces, it is an obvious temptation to concentrate high candle-powers at and near to the horizontal of the lantern. With a suitable surface texture and polish this will give a very high surface brightness, but the observer experiences heavy glare accumulating from all the lanterns visible ahead. Apart from causing discomfort, this glare decreases the sensitivity of the eyes, and the observer cannot fully appreciate the higher road brightnesses thus obtained. Furthermore, surfaces such as pavements which do not lie directly between the observer and the lanterns are at lower brightnesses, and with reduced sensitivity of the eyes these areas may appear quite dark.

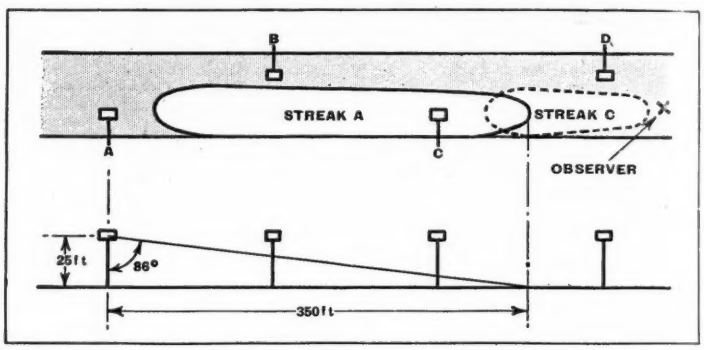


Fig. 5

It is plain that the better plan is to take advantage of the rapidly increasing road reflectivity to cut down lantern candle-powers as the horizontal is approached, thus reducing glare. The polar curve of the lantern may then show maximum intensities between 75 and 85 deg., but from between 80 and 90 deg. candle-powers should be steadily decreased to a comparatively low value at 90 deg.

Thus the exact shape of the polar curve between 70 and 90 deg. should be determined by a compromise between the two most prominent effects of a lighting scheme—road brightness and glare. There are several reasons for not employing a sharp cut-off at a specific angle, and the " controlled cut-off " is introduced to implement this vital compromise. In the author's opinion the whole future of street lighting may be bound up in this feature, and the point to be brought forward is that the light control necessary can be obtained, with line sources, only by operating horizontally.

A general principle for lantern design is derived from these considerations, and there are features of the installation layout which determine more specifically the location and gradation of the cut-off. The general adoption of an effectively controlled cut-off depends upon some degree of standardisation in mounting height and spacing, and in this respect the recommendations of the M.O.T. Report are very welcome.

Cut-off Spacing and Mounting Height

Cut-off, spacing, and mounting height are closely linked by considerations of road surface brightness. Fig. 5 shows a straight road with units at 150 ft. spacing and 25 ft. mounting height. If an observer at point X is to see a continuous lane of bright surface, streak A must run for at least 350 ft. towards him, and join up with streak C on the same side. With a

Municipal Electricity Debt Redemption

By W. E. Foden, A.S.A.A.

The author, who was formerly financial controller to the Manchester Corporation Electricity Department, defends the repayment periods allowed by the Electricity Commissioners

AT a recent meeting of an important electricity authority complaint was made (1) that the periods allowed by the Electricity Commissioners for debt redemption were in many cases much too short, and much less than the "life" of the assets represented by the expenditure; (2) that the authority's rate of redemption was much higher than the average of comparable undertakings; and (3) that the Commissioners had been approached with a view to obtaining relief.

The authority seems to be ploughing a lonely furrow as there is no evidence of a similar movement by other authorities. On the contrary, the periods are not only accepted without demur but, as brought out by Sir Harry Haward some years ago (when an Electricity Commissioner and charged with financial matters affecting the whole electricity supply industry) in an address to the Institute of Municipal Treasurers and Accountants, "many local authorities aim higher and by means of reserve funds and other appropriations from revenue provide for the cost of replacement without having recourse to a fresh loan." Sir Harry added that, in his experience, speaking generally, those responsible for the conduct of electricity undertakings are fully alive to the need for financial propriety in this respect, and are not inclined to press for extended loan periods. Many have learned wisdom in the school of experience.

Capitalised Profits

As one example only of prudent finance by local authorities in the electricity supply sphere, Manchester's last published accounts show that its capitalised profits invested in existing assets totalled £923,976; apart from reserves of £937,584, a total in all of £1,861,560; the capital outlays on existing assets being £14,345,988 and sinking funds provided against those assets equalling £6,529,427.

Examination of the Commissioners' annual statistics and the accounts published by the local authorities themselves affords ample proof of the extent to which electricity revenues are used for capital in lieu of loans, and also reveals the uniformity of the Commissioners' loan sanctioning procedure. For the whole country approximately 8 per cent. of capital has been so provided by local authorities from revenues.

It is observed that the published accounts of the complaining authority show no similar financing from revenue for capital purposes since its formation, all capital being provided from loans, nor do its accounts show any departure from the Commissioners' usual loans sanction practice. Moreover, the accounts disclose no reserve fund. At the end of 1936 local authorities as a whole had reserves of nearly 14 millions sterling, equalling nearly 5 per cent. on their capital outlays. Incidentally, it may be said that if the Commissioners granted an extension of periods in this one case, they would logically have to grant extensions to local authorities in general, if similar applications were made, which is, however, doubtful.

It is worth recalling that when the Commissioners fixed their loan periods for the country generally, they took the wise step of obtaining the views of leading municipal electrical engineers on the "useful" lives of electricity assets. The loan periods represent, in fact, a consensus of opinion throughout the country, of those best qualified to judge. In view of obsolescence, "useful" lives are obviously the only sound criterion.

From forty years' experience in the electricity supply industry, the author, having seen extensive plant and mains renewals, due mainly to obsolescence and other factors rather than mere exhaustion, is of opinion that the Commissioners' loan periods are eminently reasonable. The periods are as follows:—

	years
Land (freehold)	60
Main transmission lines (underground)	40
Buildings	30
Mains and services	25
Plant	20
Meters, motors, &c.	10
Domestic apparatus	7

Sir Harry Haward's remarks in 1926 on the rapid development of electrical science and technique rendering electricity undertakings particularly liable to become obsolescent and necessitating installation of more up-to-date plant still hold with at least undiminished force. Mr. A. P. M. Fleming, at the Management Conference at Oxford ten years later truly said: "In these days of intensive research and equally rapid expansion of new scientific knowledge, there is increasing danger of a new discovery replacing, almost overnight, processes or commodities which have involved enormous capital expenditure in plant and equipment."

The Only Remedy

The preponderant part played by recurring annual costs of interest and amortisation due to capital outlay, in comparison with other costs of coal, labour, repairs, &c., emphasises the vital importance of a sound policy of debt redemption. It is unfortunate for the industry that capital costs bulk so largely, but there is, of course, no escape, and greatly extended use of electricity spreading all costs—fixed and running—over a larger volume of business is the only economic remedy. I am convinced that, in general, municipal electricity undertakings do not regard present-day consumers as being penalised by too-early redemption of loans.

As the question at issue is largely financial, it may be pertinent to say that the accountancy profession is unlikely to view with favour any lesser provision for debt redemption than fixed by the Commissioners and resting, as noted before, on a consensus of engineering opinion.

In the early days of electricity supply there were some purists in the accountancy world who contended that double provision should be made, *i.e.*, for debt redemption and for obviating reborrowing. This idea has rightly gone into oblivion, as it is clearly no part of the duty of one generation to bear the double burden of paying for its own assets and of providing new assets for posterity. The position which might well arise through meeting the claim of the complaining authority would be the opposite of this old idea, and might saddle the next generation of its consumers with some of their predecessors' debts.

Horizontal Street Lanterns.

(Continued from preceding page)

mounting height of 25 ft., the lantern must project light at all angles up to 86 deg. to cover this distance, and a satisfactory effect could be produced on a dry road with a complete cut-off at 86 deg. Although this cut-off is only 4 deg. below the horizontal, it greatly relieves the glare position because no unit more than 280 ft. from the observer will project light on to his eyes.

In practice a complete cut-off at 86 deg. is not used, for this would make the lantern too critical in mounting, and unsuitable for wet weather conditions when the narrowing of the streak must be compensated to some degree by lengthening it. Very low candle-powers between 86 and 90 deg. are required for the latter purpose owing to the increased specularity. Again, one can go too far in eliminating glare, for the eye may adapt itself to a condition in which quite small extraneous sources cause embarrassment. It is, therefore, considered advisable to leave low intensities at 90 deg. of say 20 per cent. of the maximum. There is, of course, little virtue in projecting light above the horizontal.

It is evident that with a complete cut-off at 86 deg. a spacing of 150 ft. could not be exceeded without causing a break in the bright lane. The controlled cut-off takes care of the occasional span of 180 ft. admitted by the M.O.T. Report where practical siting difficulties are met. With mounting heights lower than 25 ft. trouble is inevitable, and the lantern designer is greatly assisted by the M.O.T. recommendations. A reduction exceeding 10 per cent. in the height designed for would mean bright lanes of inadequate length and breadth, greater glare from individual lanterns, and a general invalidating of the lantern design. By recommending a standard mounting height of 25 ft. and closely limiting spacing the M.O.T. Report foreshadows conditions under which optimum lantern distributions can be adopted generally.

With the increasing mileage of dual carriageways, thought is naturally given to the lighting possibilities. It at first appears that an important improvement will be lanterns projecting light only toward the driver in each carriageway. In this manner silhouettes would be greatly improved because the object would not be illuminated on the side normally facing the driver. In addition, glare from units on the far carriageway would be entirely eliminated. One-way traffic, however, does not mean one-way vision, and even if future pedestrians have no longer to look for approaching traffic, the driver himself still requires rear vision. It appears, therefore, that even here the controlled cut-off will prove the only relief from excessive glare.

Meetings and Discussions

On Wednesday the Transmission Section of the I.E.E. heard its last paper of the session, the subject dealt with being the control of street lighting and off-peak loads. Yesterday the annual meeting of the central body was held when the report of the council disclosed an increase of 853 in the membership.

The I.E.E. Report

THE sixty-sixth annual general meeting of the INSTITUTION OF ELECTRICAL ENGINEERS took place in London yesterday (Thursday). The report of the council shows the membership to be 18,252, an increase of 853 in the year ended March 31st last, during which 105 members of all classes died. A new rule introduced last year has been revised and now provides that after a member of any class has completed fifty years membership he will automatically (instead of voluntarily) cease to be asked to pay any further subscription.

Graduateship examinations were held twice at nine centres at home and once at nine centres abroad, there being 628 candidates. Examinations in English only were also held for 265 holders of national certificates and, in addition, thirteen candidates over thirty years of age submitted papers or theses in lieu of associate membership examinations. Candidates for studentship are not at present required to pass an examination, but in view of possible future desirability the council has approved draft regulations prepared by the joint engineering council to inaugurate a scheme for a common preliminary examination by a joint board representative of co-operating institutions.

National certificates and diplomas awarded during the year numbered 1,328 in England and Wales and sixty-three in Scotland. Nine scholarships and three grants were also awarded.

Kindred societies used the Institution premises without charge for 188 meetings, while the I.E.E. itself held 557 meetings, including those of the council and committees. The average attendance at ordinary meetings fell slightly to 255, and that at informal meetings was also lower at sixty-five. The local centres continue to be well supported and a new sub-centre has been formed for Devon and Cornwall. The Meter and Instrument Section membership is 711 and the average attendance at its meetings increased to 113; demonstrations of apparatus and works visits took place. The Transmission Section membership is 1,680, and the average attendance has grown to 117; visits to works at home and on the Continent continue to be arranged. The Wireless Section membership is 967; the attendance has fallen to 131, though attendance at this section's informal meetings increased materially to 225. The membership of the nine students' sections is 4,164, including 1,965 graduates under 28 years of age.

Co-operation with other Institutions

At the suggestion of the retiring president, Sir George Lee, the council has recently discussed means of securing closer co-ordination between the large engineering institutions, most of which fully agree that endeavours should be made to secure maximum co-operation, not only in London but also between local centres and similar branches, both at home and abroad. With special reference to overseas activities, a committee set up by the Joint Council has reported in favour of the formation of a standing joint committee in London for putting the scheme into operation and furthering its progress.

The council decided that the British National Committee of the International Conference on Large E.H.T. Systems, which is held in Paris, should no longer be an I.E.E. committee. Accordingly, it has been separated from, and has acted independently of, the I.E.E. as from March, 1938. A new committee, on which the I.E.E. will have two representatives, will take the place of the existing body and in future the British Electrical and Allied Industries Research Association will act as the new secretariat.

Increased use was made of the reference library in London; of the 7,226 readers 889 were non-members. Books presented to the library numbered 393, and 109 were purchased. Slightly more borrowers (1,231) used 2,905 books from the lending library, to which sixty-four new volumes were added. There are local technical libraries at nine provincial centres.

Following two investigations, the results of which were discussed in February, the council has set up a committee representative of the various interests concerned, to consider (1) the electrical conditions and design of equipment necessary for the elimination of explosions from hospital operating theatres and adjacent rooms, (2) the desirability of a code of safety rules, and (3) the arrangements which are appropriate for ensuring that safe equipment is installed and safe conditions maintained.

Institution Activities in 1937-38

Central Control System

The council, acting on a recommendation of the I.E.E. Joint Committee on Earthing to Water Mains, is to contribute £50 a year for a period not exceeding three years towards the cost of research to be undertaken by a joint committee (on which the I.E.E. is represented) of the Institution of Civil Engineers and the Electrical Research Association in connection with problems which arise in regard to earthing to water pipes and mains. The council has also approved, subject to comments from interested associations being considered, draft regulations in connection therewith.

The Institution's financial accounts are not mentioned in this year's report, but the benevolent fund is referred to as usual. In 1937-38 donations and subscriptions amounted to £3,031 and grants totalling £4,434 were made to seventy-three persons. In assisting these cases the fund also provided for the necessities of sixty-nine dependants. During the last few years the annual totals of the grants made have increased markedly and the expenditure last year exceeded the subscriptions by £1,403. This state of affairs is causing much anxiety, since only 5,569 members (less than one-third of the total) subscribe to the fund.

Ripple Switching

THE centralised control of public lighting and off-peak loads by means of high-frequency ripples superimposed on the distribution network, which serves as the signalling system, is dealt with in the paper by Mr. H. P. Barker (Actadis, Ltd.) that was read before the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 11th.

The author considers this method of exercising remote control of consumer circuits to be especially useful for economically developing heating loads, while one of its many possible applications is to the extinction of public lighting and for the dissemination of warning signals in war time.

Reference is made to the disabilities of other methods of collective control, such as the earth-return, star-neutral and d.c. bias systems. Localised systems, except for very small networks or where a separate pilot exists to each sub-station, are not considered to offer sufficient advantage over time-switch control. The distinction is that with a centralised system the actuating ripple injected at the generating station must traverse the high-voltage feeders and pass through sub-stations before operating the reception relays.

Consumers' Voltage Practically Unaffected

If the signal has a frequency substantially higher than that of the load itself the effect on the consumers' voltage at the moment of signalling is inappreciable, even though the signal voltage may be considerable; for example, 500 cycles at 1,000 V (r.m.s.) superimposed on 50 cycles at 11,000 V. A three-phase audio-frequency ripple is transformed by the sub-stations in the same voltage ratio as the load and reappears as a phase-to-phase or phase-to-neutral voltage on a four-wire system in precisely the same manner as the load itself. Ordinarily, the effects of attenuation and reflection do not need to be considered, but may have to be in the case of long overhead lines.

The parallel emission method has been employed at Hollywood, California and at Potsdam, Germany, but the author prefers series injection since it enables the short circuiting effect of the source of main supply to be turned to advantage. The impedance of this source is lower than that of the network; hence the ripple voltage is mostly dissipated across the distribution system. A further advantage of using emission transformers connected in series is that they enable the ripple to be injected into the outgoing feeders sequentially rather than simultaneously, so reducing the amount of ripple power needed. But feeders interconnected outside the station must be energised simultaneously.

The author briefly refers to the ripple generator, of 30 to 75 kVA, with its protective and stabilising devices, and mentions some of the factors which may restrict application of the system in special cases. For instance, it is desirable not to subject the ripple to more than three transformations, otherwise transformer reactance may demand too much ripple power. It is difficult to apply the series method when more than six feeders are interconnected externally, and when the network is fed from two power stations separate ripple emitters may have to be provided in each of the primary sub-stations. Special consideration is necessary when receiving relays are needed more than 50 cable miles from the transmitter.

Early installations were used at Leatherhead, Dartford and the Isle of Man. The latest is that of the Maidstone Corporation, which employs four frequencies for the control of public

Correspondence

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

One-tenth of a Penny per £1

Last year the amount which the Electrical Industries Benevolent Association paid out in grants jumped by 43 per cent. and this year's figures are showing a similar increase. In view of this, and to ensure that, whatever bad times may lie ahead, the E.I.B.A. will always be able to meet the needs of the industry, it is essential to build up our reserve funds to a quarter of a million pounds, and this year I am trying to find the £190,000 necessary to do this. It may seem a large figure, but it is the minimum for an industry the size of ours.

That this is a big task, I know; but if every trading concern, company and municipal, would make a donation of one-tenth of a penny for every pound of its capital the goal would be reached.

The Association helps every class of non-manual worker in every branch of the electrical industry; pension funds are no safeguard against the majority of the misfortunes which the E.I.B.A. alleviates and private benevolent funds—good work though they do—cannot stand the financial strain of serious and prolonged cases. The 1938 campaign to attract a fair measure of support from all is open, and I shall be grateful for all amounts sent to me at the headquarters of the Association, 6, Southampton Street, Holborn, W.C.1.

Holborn, W.C.1, ERNEST E. SHARP,
May 10th. E.I.B.A. President.

The Case of the Shift Engineer

In your issue of May 6th "Combustion" puts the case of the shift engineer very clearly, but far too mildly. It is rather unfortunate that the letter by "D. L." should follow, as he is apparently one of the very few who do not feel the limitations which shift work imposes, both on health and social life. "Combustion" might have added a reference to the bad effect of shift work on the family man's home life and the necessity of always being on shift at the appointed time in order that one's fellow workers may not be required to make up any deficiency.

Shift work in the essential services is, of course, unavoidable. The indispensability of a shift engineer is recognised by the authorities, insofar as it is a rule that he must stay on duty until he is relieved. Here the day man has a great advantage. In illness, however slight, his presence at his work is not essential, whereas it is a point of honour among shift engineers that unless proper reliefs are easily available (and on how many jobs are they?) an engineer must make his relief as long as he can move one foot in front of the other.

The crux of the matter lies in the small number of shift engineers compared with all the others. The authorities who are partly responsible for shift conditions have little experience of shift work themselves (and that not obtained under present conditions) and are inclined to consider grievances as imaginary. Shift engineers are too small a minority to make their voices heard. The engineers' associations that were originally introduced by shift engineers now claim as members those whose classification as engineers appears somewhat remote. This is unavoidable in a rapidly expanding industry, and is due in no small measure to the attitude of shift engineers themselves.

The evils of shift work will have to be mitigated very soon. Increases in the shift staff, thus allowing for illness or holidays without throwing extra hours of work upon others, shorter working hours, and adequate promotion schemes which will ensure day work after a specified time on shift work are required. Of the totally inadequate salaries at present paid I will say nothing.

In view of the failure, or unwillingness, of engineers' associations to improve shift work conditions the matter rests with the shift engineers themselves. A new organisation is now arising which feels that if the shift engineers' complaints are decently and honourably placed before the responsible authorities, these authorities themselves can be trusted to do all in their power to improve conditions. To achieve any measure of success, however, the new organisation will need the full support of every shift engineer.

May 8th. J.

Salaries Schedules

I was very interested to read the article on this subject in your issue of April 29th, and also to note your editorial comment "that the N.J.B. Schedule has never been a perfect basis of remuneration, and the changing conditions in the industry have brought to light (or caused) a number of shortcomings and anomalies."

If the Government's Distribution Bill becomes law then it would appear that this will form the first stage in a scheme of complete nationalisation. Scales of salaries covering every grade in the supply industry would then be essential, so why cannot the C.E.B. and municipal and company undertakings get together and evolve suitable salary schedules now?

These schedules would of course have to cover not only power station staffs, but also the following grades:—Mains and sub-station engineers, sales or commercial engineers, operation and maintenance engineers, installation engineers, &c. H. J. FRASER, A.M.I.E.E.

Liverpool, *May 2nd.*

"Another Power Engineer," writing in your issue of May 6th, seems to have had a rough passage, but he should not vent his spleen on those who have been "fortunate" enough to hold jobs in a "super" power station. If, as he contends, the original staffs of selected stations are not capable of handling their big jobs, then it rests with the chief, and no one else, to replace them, and the chief would need no assistance from disgruntled individuals.

A. P. E. asserts that in the super station the sets are only started and stopped once or twice a week. I fail to see that this is any criterion of the work done on the job. If that is his idea of running a station then he has something to learn. As for relying on the secondary stations for assistance, I have not seen the necessity during the last five years, and this applies to any plant where the staff look after their jobs. They are the men who deserve the "plums," and get them, too.

The grounding obtained in the smaller stations undoubtedly fits a man for the larger plants, but as the size and output increase, so the responsibility increases also.

The letter of "Combustion" in the same issue of the ELECTRICAL REVIEW makes out a sensible case for those whose duty lies along the lines of shift work, and is, moreover, one which will help and not retard the case. T.R. SELECTED.

May 8th.

High-voltage Technology

My attention has been drawn to an article entitled "High-voltage Technology" in your issue of April 22nd, and in it there are some statements which, I feel, I cannot pass without comment. At the beginning the author states that no regular course on this subject has been given in any English university. The College of Technology, Manchester, on its recognition as the Faculty of Technology in the University in 1905, already possessed a high-tension laboratory (as the School of Technology it was first equipped with one in 1901, and research on insulation materials was started in 1903).

Since 1923 a regular course in high-voltage engineering has been part of the curriculum of the honours course in the Electrical Department, and at the present time those students who choose to specialise in this subject (generally about eight per

Meetings and Discussions *(Continued from preceding page)*

lighting and off-peak heating loads on both a.c. and d.c. networks (see ELECTRICAL REVIEW, December 17th, 1937, p. 850). The system is also in use in Belgium, and in France (particularly the Paris region) twenty-eight installations are in operation which provide nine-frequency ripple service over an area of nearly 1,000 sq. miles.

The Faraday Lecture.—Following the annual general meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on May 12th, Dr. A. P. M. Fleming, a vice-president, delivered the annual Faraday Lecture. It is to be repeated at Dundee and at the eight provincial centres where it has already been delivered. This lecture attracted audiences totalling 5,980, of whom more than 4,930 were non-members. Dr. Fleming chose as his subject "The Evolution of Electrical Power," illustrated with lantern slides and cinematograph films, together with experimental demonstrations of Faraday's earth inductor, the crystal structure of metals, the magnetic detection of cracks in metals; electric breakdown phenomena in gaseous, liquid and solid insulating materials; the motive power obtainable from thermo-electric, thermo-magnetic and photo-voltaic processes; and the energy changes associated with the process of atomic disintegration. A more detailed summary of the lecture was published in the ELECTRICAL REVIEW of February 18th last, following its presentation at the Liverpool centre.

year) spend about ten hours a week on it in lectures and practical work. It has actually trained a large proportion of those who at the moment occupy high positions in industry, and many of them are heads of high-voltage laboratories.

This laboratory was the first in the country to be equipped with an impulse generator, which was installed in 1926; a 250-kV Metro-Vick Schering bridge was added about six years ago, and a high-voltage cathode-ray oscillograph has been constructed in the college. Work on all kinds of insulating materials and on completed insulators is carried out and, in fact, forms a part of the normal curriculum. Actually, the college possesses two high-voltage laboratories and an additional room for insulation research.

It is true that at the moment, owing to considerations of space, the available voltage is limited to 100 kV, but on the completion of the new extensions this will probably be raised to 750 kV. It is, however, important to note that these very high voltages are only required for a small percentage of the work; many fundamental investigations can and must be carried out at lower voltages, since they can be made on the individual components and not on the complete assembly. On the research side it has since its foundation worked in close contact with the B.E.I.R.A., now the E.R.A., and some of their specifications (in particular oil and porcelain) are based on the work done by it. It has also, since 1912, assisted in the improvement of design and performance of porcelain line insulators of British manufacture, including those for polluted areas.

The published work of Mr. J. L. Langton and his work for the E.R.A. will confirm these facts.

J. HOLLINGWORTH,
Professor of Electrical Engineering, Manchester University.
May 6th.

The Street Lighting Report

I should like to support the remarks of your contributor "Onlooker" in his article in your issue of April 22nd about the Ministry of Transport's dismissal of the cut-off fitting without any expression of views. That a *final* report should contain the words (para. 40) "Our experience of installations in which the cut-off type of distribution is used has not as yet been wide enough to enable us to reach definite conclusions" would appear to prevent any cut-off installation from ever being "in accordance with the Committee's recommendations."

The advocate of a cut-off scheme must always use some qualifying phrase, such as "so far as the recommendations apply," which naturally acts prejudicially against the scheme, irrespective of its technical merits or demerits. There is an immediate need for detailed recommendations for cut-off installations, with an authority equal to that for the non cut-off style.

In one particular, though, "Onlooker" would appear to have misjudged the report. He says that "the report does not indicate how the spacing should be modified according to the sharpness of the bend." The rule given in paragraph 46, as qualified by paragraph 45, forms a good working basis for most cases.

There are, however, some people who would welcome an explanation of why a cut-off device, which clearly decreases the length of the bright patch, should also be said to decrease its width to the extent suggested at the end of paragraph 46.

Stockport, *May 2nd.* NOEL CORCORAN.

Working to Music

We can readily believe that the installation of music at Mr. Reginald Leslie's factory has considerably increased production. We ourselves installed music in our Birmingham factory about a year ago. Apart from any consideration of production, the effect of this music is reflected in the happiness of the workpeople, and we have not suffered from the general shortage of labour at present prevailing in the Midlands.

BERRY'S ELECTRIC, LTD.,
London, W.1, *May 6th.* RAYMOND BERRY, *Director.*

Costs in the Boiler House

With reference to the article by G. O. McLean in your issue of April 29th some of the figures for costs are, I think, somewhat high.

It is stated that the cost of electrostatic precipitation plants with efficiencies between 95 and 98 per cent. is approximately £0.5 per kW installed. This is rather high, at least for British precipitators, for the average cost of the last twelve precipitators installed in central stations by the Sturtevant Engineering Co. averages £0.35 per kW installed, with the highest figure, on a rather special plant, of £0.45 and a minimum figure, on an installation giving at least 96½ per cent. efficiency, of £0.28 per kW.

A discrepancy of £0.15 per kW would make a considerable difference to the actual cost of a precipitation plant for, say, 100,000 kW, and since the plants from which I have taken these figures are those which have been erected lately and the ones built five or six years ago are left out of the calculations, my figures are quite up to date. These plants have been installed for quite a number of different stations all over the country, so that the various site difficulties and local engineers' preferences have all been taken into consideration.

I also think that the cost of £0.02 per kW is much too low for cyclones if they are used on pulverised fuel, although this is not very good practice. However, on one installation where Sturtevant precipitators were installed and where the cost for these plants was £0.28 per kW, the price quoted for cyclones, which probably would not have given more than 50 per cent. efficiency, was £0.08 per kW; in other words, on this individual station, where there was an excellent opportunity of comparing the two costs, the cyclones would have been four times the figure quoted in Mr. McLean's article and the precipitators just over half the price stated.

There is just one other point which might be mentioned, and that is the statement that "with coals of low sulphur content electrical precipitation removes 95 to 98 per cent. of the grit and dust." I understand the author's meaning to be that precipitators will not remove the sulphur gases, but some readers may assume from this statement that a precipitator will not work satisfactorily on the dust and gas produced by the burning of coals with a high sulphur content. This, of course, is not correct, for the larger the percentage of SO_2 and SO_3 in gases the more perfect is the operation of the electrostatic plant. H. W. WAGNER.

London, E.C.4, *May 5th.*

[Mr. G. O. McLean replies:—"I am extremely obliged to Mr. Wagner for the latest precipitator costs he has put forward. The approximate figure given in my article was based on Leicester costs in the absence of financial figures from manufacturers. This may have been high, but I considered the job to be an average sized, straightforward installation. I do not agree that the cyclone costs are low. The figure given was based on actual contracts for stoker-fired installations, and it is not suggested that cyclones are suitable for pulverised fuel. I would confirm Mr. Wagner's reading of my statement regarding precipitator efficiency on sulphur-laden gases."—EDS. ELEC. REV.]

Low Voltage Loses Client

Referring to the letter in your issue of the 6th, may not the owners of the hotel with the 50-V supply perhaps congratulate themselves? For, if their supply were 230 V a.c. and they permitted the indiscriminate use of electrical appliances by their guests, might they not feel some responsibility for any risk thereby incurred, *e.g.*, in the event of an unearthed appliance being connected to a lampholder in a bathroom?

May 7th. SAFETY.

I was interested to read in your Correspondence section the suggestion by an electricity supply company that perhaps a particular hotel with a private power plant would now go over to them.

Is there anything against the hotel putting in a transformer so as to transform the voltage up to 230/250 V? This seems, to my mind, the obvious answer, as it might well be cheaper and still have the blessing of independence.

May 6th. INTERESTED.

[The private plant might, however, generate d.c., in which case the stepping-up of the voltage would become a relatively inefficient arrangement.—EDS. ELEC. REV.]

The Cooking Peak

In his article in your issue of May 6th Mr. V. G. Clark states that in my recent paper to the Institution of Electrical Engineers on "Domestic Electric Cookers" I gave the cost of 3s. 11d. for maintenance. It is to be regretted that Mr. Clark did not take more trouble to ascertain what was stated in the paper. The figure of 3s. 11d. which he gives is that pertaining to the cost incurred in dealing with cookers brought in owing to changes of tenancy, &c., being reconditioned and sent out again. The maintenance cost proper was given as 10s. 2d. per annum, to which must be added the changing and reconditioning cost of 3s. 11d., making a total of 14s. 1d., which is a very different figure indeed from that given by Mr. Clark, and which represents the average cost over two years for maintenance of electric cookers in Hull. J. N. WAITE,

General Manager and Engineer.

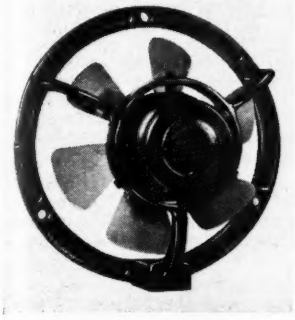
Kingston-upon-Hull, *May 9th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Ring-mounted Fan

Particularly for use in refrigerator cold rooms the "Delco" unmounted fan has now been provided with a cast ring complete with terminal box. An unusual claim is that the fan is suitable for general commercial use as the motor will not burn out even when stalled.



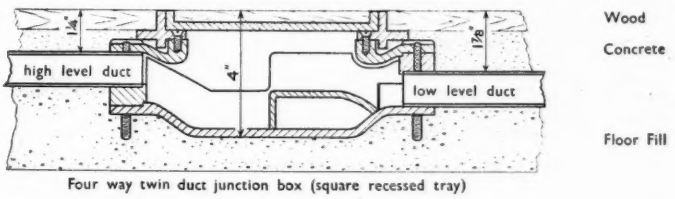
The "Delco" ring-mounted fan

The oil reservoir is exceptionally large — ensuring an adequate supply of oil sufficient for very long periods of continuous running. The overall diameter of the ring mounting is 10 in. with a fan diameter of approximately 8 in. The electrical input is 28 W at 1,150 r.p.m., and the fan delivers approximately 300 cu. ft. of free air per min. It is also available with special blades arranged for other air deliveries.

The motor is of the self-starting, shaded-pole, induction type and can be controlled through a simple 5-A tumbler switch of orthodox design. The makers are DELCO-REMY & HYATT, LTD., 111, Grosvenor Road, London, S.W.1.

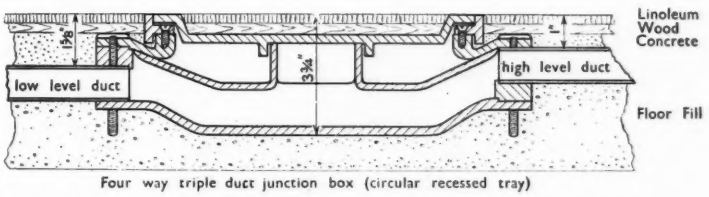
Under-floor Duct Wiring

With a view to enabling architects and consulting engineers to plan the electrical installations of buildings in advance, without regard to the position of fixtures, furniture and general equipment, WALSALL CONDUITS, LTD., Excelsior Works, Dial Lane, West Bromwich, are introducing an under-floor duct system. It is designed to provide for future extensions as well as immediate requirements and to avoid the need for trailing cables. The "Walsall" system consists of a network of single, twin or triple rectangular steel ducts fitted with malleable iron screwed inserts (formed during manufacture) spaced at intervals to provide service outlets where required. Junction boxes are recessed in the floor and the whole forms a continuous metallic system, duct spacing being at 36-in. centres.



Four way twin duct junction box (square recessed tray)

Sectional diagram of the Walsall under-floor duct wiring

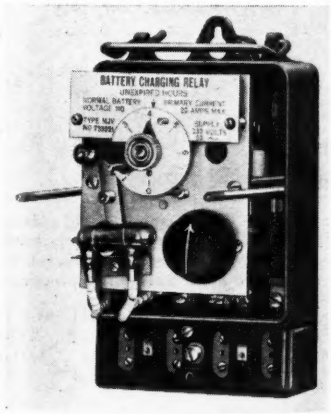


Four way triple duct junction box (circular recessed tray)

The duct is made in 12 ft. lengths of 15 s.w.g. steel, black enamelled or hot galvanised and is available in three sizes, *viz.*, 2⅛ in. wide by 1⅛ in. high, 2⅛ in. by 1½ in. and 2½ in. by 1 in.

Automatic Battery Charging Relay

An automatic battery charging relay especially suitable for electric vehicle battery charging at night without attendance is now obtainable from BRITANNIA BATTERIES, LTD., Redditch.



The Britannia Batteries charging relay

Designed for use with a.c. rectifier equipments, it operates on the principle that the charging of the battery is effected in a predetermined time-interval after its voltage has reached 2.4 V per cell, at which point the battery voltage rises rapidly and the cells commence to gas. This ensures that the battery always receives the correct charge, whatever the amount of discharge.

The relay, which is mounted on the switchboard, incorporates a vacuum-tube type voltage relay, in which a pair of contacts is closed when 2.4 V per cell is reached. This switches on a self-starting synchronous motor-driven timing device which turns a timing disc carrying a cam, the latter being arranged to operate a mercury switch after a predetermined time. This switch may be arranged to break the a.c. supply. The slightly delayed action of the vacuum-tube voltage relay obviates possible difficulties resulting from momentary variations in the supply voltage. The timing device may be adjusted between 1 and 6 hours.

Rubber-bladed Fans

A silent rubber-bladed fan is the latest introduction by ELECTRICAL COMMODITIES, LTD., Sparton Works, Beresford Avenue, Stonebridge Park, London, N.W. The blades are guaranteed for five years against cracking or becoming brittle and the fan is claimed to be practically silent in operation.

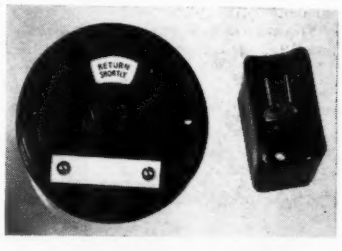
The "Safe-Flex" rubber-bladed fan

On the 6-, 8- and 10-in. models the bearings are oil-less and self-aligning, while on other models there are bronze bearings with built-in reservoirs. The shaft is of high-tensile steel with a mirror finish and ground to extreme accuracy. The motor housing is of sheet steel and an air chamber front and back makes for cool operation. The motor windings are pressed into the motor housing to prevent vibration and noise, and the bases and arms are of solid, sturdy construction. The construction of the motor prevents permanent damage to the mechanism of the fan even when the blade assembly is held in a stalled condition.

The "Safe-Flex" fans are supplied in sizes of from 6 in. to 24 in., as wall bracket mounting, desk mounting or as pedestal floor models, and there are also 6- and 12-V models available for use on motor cars. The 6-, 8- and 24-in. models are stationary and have a single speed. The 10-in. model has two speeds and can be supplied either stationary or oscillating. The 16-in. model has three speeds and is an oscillating fan.

Moulded Accessories

Two accessories developed recently by the COLLIER ELECTRIC, CO., LTD., Edwin Road, Twickenham, include a novel bell push and a tubelight holder. The bell push, of black bakelite, has the usual form of press contact, but attached to the push is a white dial, bearing the words "In," "Out," and "Return Shortly." By turning the press-button the appropriate word is brought into view. The contact for bell ringing is made only when the push is in the "In" position.



The Collier bell push and tubelight holder

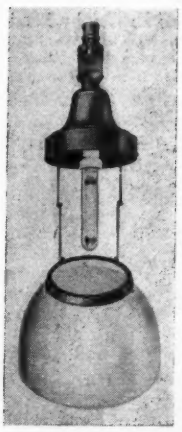
Sprung clip contacts of a bronze compound are employed in the tubelight holder, which is also of moulded construction, the wiring screw being at the back where four knock-outs are provided.

D

Lantern for Railway Stations

The "Concourse" lantern of the EDISON SWAN ELECTRIC CO., LTD., 155, Charing Cross Road, London, W.C.2, is the outcome of close co-operation with the L. & N.E. Railway Co., by which large supplies have been taken.

It was necessary to provide primarily downward intensity but allow a certain amount of light to reach the roof to create a cheerful atmosphere and avoid "tunnel effect," and it was also considered essential to obscure the lamp filament to obviate glare. The solution was the production of a single piece of glass combining the functions of opal and pearl. The upper part is opalescent and the lower flat bottom is of a glass similar to that of a "pearl" lamp. Thus the opalescent top acts as a reflector, the curvature of which directs the light into the lower hemisphere, at the same time allowing just sufficient light into the upper hemisphere to light the station roof.



The "Ediswan" lantern for railway stations

The globe is fixed to a cast metal ring and covered by a wire guard of geometrical design. When in position the globe is supported by two studs placed 120 deg. apart which are engaged by a quick-release latch placed at a further 120 deg. Thus no screws are required to support the globe, and the fastening is perfectly positive To facilitate cleaning, this latch is simply released and the whole globe assembly is lowered on a pair of "slow tongs," thus leaving the cleaner's two hands free. In addition, there is an interesting anti-condensation device. Where long down-tubes are placed in positions which are atmospherically affected by the open ends of the station and the hot blasts from locomotive chimneys condensation forms in the down-tubes and drops of water fall into the lampholder immediately below. The "Ediswan" anti-condensation device is fitted to the uppermost point of the "Concourse" lantern, to which the down-tube is jointed. Moisture is thus deflected clear of the lamp contacts.

Internally, the lamp is very similar to the "Escura" luminescent lamp, the internal surface of the outer of the globes being treated with fluorescent powder.

A Hand Electric Polisher

For several years L. G. HAWKINS & Co., LTD., 30-35, Drury Lane, London, W.C.2, have marketed a small hand-type vacuum cleaner. Now a hand-type "Supreme" polisher has been added. This is particularly suitable for polishing furniture, motor cars, panelling and woodwork. For polishing floors a long handle can be slipped into position and a single revolving brush applies the wax. A special felt pad is designed to fit over the brush for polishing and for use on paints and the softer woods. One-finger control is provided by means of a switch in the motor casing, the motor being mounted vertically.

The "Supreme" hand type polisher

Small Accessories

Two new "Beeka" accessories (W. & E. KUPFER, 284, Finsbury Street, London, E.C.2) are a push-bar lampholder and an iron connector.

The push-bar lampholder is of robust construction in brown bakelite. Its special feature is the universal fitting enabling the holder to be used for ½-in thread, for flexible cable, and for tough rough cable, a cord grip being provided for the last two.

Two new Kupfer accessories

The iron connector is fitted with a rubber guard for side entry at an angle The contacts are of nickel-plated phosphor bronze, the connectors being obtainable in black, brown, red, green and blue, with or without an earthing contact.

Sodium Floodlight Projectors

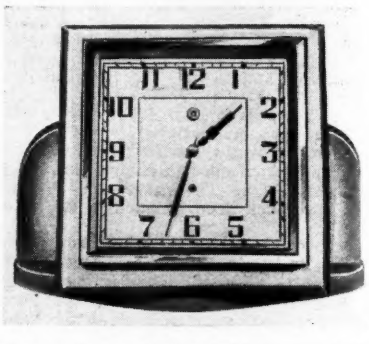
Weatherproof sodium floodlighting units are being manufactured by ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley Hill, Birmingham, in the form of two overhead mounting types, a directional model giving a long forward light throw with a clean cut-off behind the mounting line, and a non-directional unit a wide dispersive light throw.

Both are made of heavy gauge steel, white vitreous enamelled inside and grey outside and supplied with substantial double pole clamps. All the necessary control gear is mounted in a weatherproof housing arranged on the top of the fitting.

For upward projection Model 923 has been introduced to give a broad beam which can be varied considerably by a special method of adjustment without rotating the floodlight. In addition, the direction of the throw of light can be varied by rotating the complete unit in its supporting stirrup. It is made of heavy-gauge lead-coated steel finished in synthetic enamel, and incorporates a weatherproof housing for the control gear.

Electric Clocks

An unusually simple movement is employed in the range of "Neatlite" clocks made by the NATIONAL CLOCK MANUFACTURING Co., LTD., 18, St. Bride Street, London, E.C.4. The low-speed motor runs on a bush ¾ in. long, supported on ball bearings, the oiling of this bush being on the vacuum principle.



One of the new "Neatlite" clocks

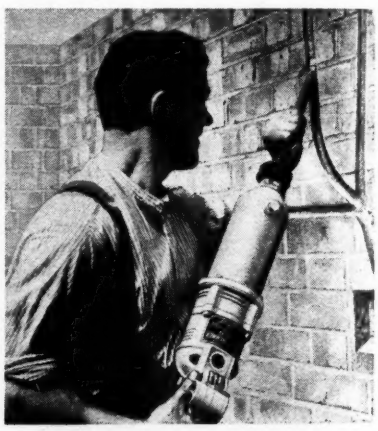
Several new models have been introduced this year, notably mirror clocks which have been made available in rose, blue, green, amber and white. In each case the digits, which do not take the form of actual numerals, are etched in the glass and the hands are chromium plated. Other styles have the clock in one corner of the mirror, the remainder having some sort of etched design.

In addition, there is a range of low-priced wooden faced clocks, specially introduced to compete with cheap imported types.

Electric Hammers

Several improvements have been effected in the design of the "Kango" electric hammer by the RAWLPLUG CO., LTD., Cromwell Road, London, S.W.7.

Models "C" and "D" heavy duty hammers now have rubber bellows over the tool socket to stop dust and dirt getting into the oil in the hammer casing. A duplex fan draws air through the motor casing to keep the motor end cool, and an efficient oil seal between the motor and hammer casing enables the hammer to be operated in any position without leakage. A universal motor is fitted. Minor improvements have been made in the selection of suitable metals, hardening processes, &c.



The "Kango" hammer chase cutting for electric conduit

Model "C" has a speed of 10,500 r.p.m. giving 1,600 percussions per min., is rated at 350 W, and weighs 16 lb. Type "D" is larger, and, driven by a 450-W motor, runs at 10,000 r.p.m., giving 1,400 blows per min. twice as powerful as those given by model "C."

A lighter and lower priced model is type "K.B.," which has a speed of 7,500 r.p.m., weighs 11¼ lb., is rated at 160 W, and strikes 1,300 times per min. It is capable of drilling holes of up to ⅝ in. in diameter. The universal motor, controlled by a simple thumb operated switch, rotates a striker through a pair of bevelled wheels inside the hammer casing which is attached to the motor. The large bevel wheel is fixed to the striker through a clutch mechanism to avoid damage to the armature or bevel wheels. The motor is fan cooled.

The Hire Purchase Bill

By "Barrister-at-Law"

How it affects supply undertakings

THE Hire Purchase Bill completed all its stages in the House of Commons last Friday amidst a chorus of congratulations, and it is safe to say that the form in which it now stands will not be greatly changed before it becomes law.

Its principal purpose is admirable, since it is generally agreed that hire-purchase trading has in certain quarters been abused to the great detriment of the poorer sections of the community. In its original form, however, the Bill was unsatisfactory and illustrated the manner in which the zeal for reform can ignore practical considerations. The hire-purchase system has penetrated every industry and when it is applied with fairness and integrity it has proved to be of the utmost benefit both to industry and the public. The circumstances of every industry, however, differ greatly, and it is obviously essential that the remedy of admitted abuses should not be capable of inflicting injury upon the legitimate business of any section of the nation's commerce.

The business of public utility undertakings differs fundamentally from that of the ordinary trader or shopkeeper and no Bill which disregards this distinction can be viewed as satisfactory. This difference is particularly noticeable in the sphere of hire-purchase trading. The ordinary retailer sells goods either for cash or on hire-purchase terms as the main part of his business, and is entirely dependent upon such sales for his profit. In the case of the public utility, however, the sale of apparatus and appliances is ancillary and subsidiary to its main function—the sale of electricity. It has, therefore, no inducement to "snatch back" appliances from its consumers, but on the contrary is vitally interested to secure their retention by the consumers in order to foster the consumption of its main commodity.

As is so frequently emphasised, a large section of the population cannot afford to purchase electrical appliances outright, and it is solely for the purpose of placing such appliances within the reach of the man in the street that hire-purchase terms are offered by electricity undertakings.

Such arguments were the basis of the claim for complete exemption of the contracts of public utilities which was urged on the committee stage of the Bill. The distinction, however, between the private trader and the public utility was not, in our view, sufficiently appreciated by Members of Parliament, who appeared to fear that total exclusion would place electricity undertakings in a position of unfair advantage over the ordinary retailer. The claim for exclusion was therefore rejected, and a prolonged series of negotiations with the promoter of the Bill and the Government became necessary. These negotiations were entrusted to the Conjoint Conference of Public Utility Undertakings, which represents all the gas, water, and electricity associations of the country. This organisation has proved of the utmost value in acting in many matters in which the interests of all public utilities are identical, and the combination of three of the greatest industries in the country results in the application of a pressure which it is impossible to ignore. It is satisfactory that the negotiations of the Conjoint Conference have resulted in a reasonable settlement of all difficulties.

Installation Compromise

Of these difficulties the most complex was that of the installation charge which normally arises in the fitting of electrical appliances and apparatus. As the Bill originally stood any hirer was to be entitled to return the goods to the owner after he had paid one-third of the instalments. Further, no owner was to be entitled, on default by the hirer, to resume possession of the goods except by applying to the County Court if one-third of the instalments had been paid.

Such provisions would have worked extremely harshly in connection with public utility contracts, in which a substantial portion of each instalment is allocated to installation charges. The cost of installation is in some cases equal to the cost of the appliance. If the hirer is to receive the right to return the appliance after the payment of one-third of the instalments, the result would be that the undertaking, while obtaining nothing in respect of the appliance, would, in addition, be out of pocket in respect of installation costs.

The solution which has been reached involves the separation of the installation and fixing costs from the hire-purchase price. Before any right to return the goods arises the whole of installation charges must be paid, together with one-half of the cost. It will, however, be necessary to state in every agreement the amount of the installation and fixing charges. It is thought that this solution is very satisfactory.

The Bill will not come into operation until July 1st, 1939. It will apply to all hire-purchase agreements and credit sale agreements (*i.e.*, agreements for sale under which the price is paid by instalments) where the value of the goods is under £100. There are certain exceptions as to the value of the goods, but these for our purpose are irrelevant.

The price for which the goods may be purchased for cash must be declared either verbally or by ticketing the goods. A note or memorandum of every hire-purchase agreement must be made and signed by or on behalf of the undertaking and also by the hirer. It is important to notice that if the hirer is the husband, the signature of the wife will not bind him. Where the negotiations for sale are conducted with the wife, it is essential to obtain the husband's signature if he is to be liable.

The note of the hire-purchase contract must include: (*a*) The hire-purchase price and the cash price; (*b*) the amount of each instalment and the date upon which it is payable (where the instalments are to be collected at the time that collections are made from slot meters it will be sufficient to state that fact); (*c*) a list of the goods; (*d*) a note, which is to be at least as prominent as the rest of the memorandum, indicating the right which is conferred by the Bill upon the hirer to return the goods and the restriction imposed by the Bill upon the owner with regard to the recovery of possession, this note to be in the form set out in the Schedule of the Bill.

A similar memorandum must be given in the case of a credit sale agreement except that in such a case (*d*) will not be applicable as the purchaser has no right to return the goods.

A hirer under a hire-purchase agreement may terminate any hire-purchase contract made after July 1st, 1939, if he has paid the whole of the installation costs to the amount specified in the agreement and, in addition, one-half of the hire-purchase price.

Undertakings will be under an obligation to supply within four days from the receipt of a demand from the hirer upon payment of a shilling a copy of the memorandum and a signed statement as to the amount paid by the hirer to date; the amount of any arrears outstanding and the date upon which they became due; and the amount which is to become payable, the date upon which each future instalment is to become payable and the amount of each such instalment. Similar provisions are applicable to credit sale agreements.

Repossession Provisions

One of the most important provisions of the Bill is that contained in clause 9. This clause originally provided that if a hirer who had paid one-third of the hire-purchase price defaulted under the agreement, the owner could not resume possession unless he had obtained an order from the County Court. As a result of the amendment incorporated on the report stage it will not be necessary for an undertaking to apply to the County Court until the whole of the installation charges specified in the agreement, together with one-third of the hire-purchase price, have been paid. Unless these amounts have been paid the undertaking may resume possession without any application to the Court. Clause 9 is retrospective in effect and will therefore apply to hire-purchase contracts made before the date upon which the Bill comes into operation. Such existing contracts may not specify the amount of the installation charges as a separate item; and therefore difficulty might arise if the Bill remained in its present state. It is satisfactory that the Attorney-General has promised that this point shall be met in the Lords.

A special section relates to a hirer who is liable to make payments under two or more agreements with the same owner. Where the hirer makes any payment not sufficient to discharge his liabilities under all his agreements, he may appropriate the payment towards the satisfaction of sums owing under any one of the agreements, or towards sums owing under two or more of the agreements in such proportions as he thinks fit. This provision was designed to stop a practice which has arisen in some quarters of inducing a hirer who has almost completed the payments of sums due under one agreement to enter into another agreement covering both the goods included in the first agreement and other goods. If the hirer defaulted under the second agreement, the owner would resume possession of all the goods.

Although the right to apportion payments between two or more agreements may in some cases cause some inconvenience to electricity undertakings, this will be willingly endured if it results in the elimination of a serious abuse in hire-purchase trading.

Parliamentary News (BY OUR SPECIAL REPORTER)

London Transport and the Grid

When the Select Committee of the House of Commons which considered the London Passenger Transport Bill met on May 4th it was announced that the Board and the London electricity supply companies had agreed on a clause relating to the taking by the Board of electricity from the Central Electricity Board.

There was some discussion with the Ministry of Transport's representative and finally the clause was adopted providing that the Transport Board and the Central Electricity Board, with the consent of the Electricity Commissioners, may enter into and carry into effect agreements for the supply of electricity by the Central Board to the Transport Board during any time of emergency, including stoppage, loss, damage, failure, overhaul, repair or testing of plant or equipment of the Transport Board, or by the Board to the Central Electricity Board at any time at such prices and upon such terms and conditions as may be agreed between them and any electricity so supplied may be used by the Board or the Central Board (as the case may be) for any of the purposes of their undertaking, including (in the case of the Transport Board) the supply of electricity to any person to whom it is for the time being authorised to give a supply. It is provided that no supply of electricity shall be taken by the Transport Board from the Central Board under this section if another authorised undertaker shall at the commencement of the time of emergency be able and willing to give a reasonable, convenient and adequate supply to the Transport Board.

Such an agreement entered into under this section shall not contain any provision enabling the Central Electricity Board to require the extension of any generating plant of the Transport Board.

The Bill as amended was ordered to be reported for third reading.

Brighton Trolley Vehicles

A Select Committee of the House of Commons presided over by Sir D. Reid (Down, U.) considered on May 5th a Bill promoted by Brighton Corporation to confirm an agreement with the Brighton, Hove and District Omnibus Co. for the pooling of traffic and to secure powers to substitute trolley vehicles for trams. The Bill was opposed by Southdown Motor Services.

After some evidence had been heard the Committee adjourned until May 11th to allow of negotiations between the parties.

Electricians and the Cinema Dispute

On May 9th Mr. Denville asked the Minister of Labour whether he could make any statement as to the result of the action taken by his officers to adjust the differences in the cinema industry due to the endeavour of the E.T.U. to insist on claims which were not supported by the recognised trade union in the industry; and whether, if no result had been hitherto achieved, further action could be taken to avoid the continuance of sabotage and damage to cinemas which was now being carried out by disaffected workers.

Mr. Lennox-Boyd said that the differences in the cinema industry had not been reported to the Minister by any of the parties concerned, nor had he been asked to intervene. He understood, however, that conversations were proceeding which would, he hoped, enable a settlement to be reached. He had no information which supported the suggestion contained in the last part of the question.

Mr. Denville asked the Home Secretary whether the attention of the Metropolitan Police had been called to the cases of sabotage in various cinemas as a result of the refusal of the cinema industry to recognise the claims of the E.T.U., and whether he would instruct the chief commissioner to investigate any action of the kind.

Mr. Geoffrey Lloyd said that during the last two weeks the Metropolitan Police had received reports of a few cases in which malicious damage had been done to apparatus in cinemas, and these cases were now under investigation.

Hire Purchase Bill

On May 6th, during the report stage of the Hire Purchase Bill, Miss Wilkinson, who was in charge of the measure, moved a new clause making special provision for charges for gas and water pipes and electrical installations She explained that there was a strong desire on the part of public utilities and municipal corporations supplying fixtures and installing water, gas and electricity that they should be left out of the Bill completely. The promoters felt that it was not possible to draw this line between public utility undertakings and the ordinary traders, but they felt that the public utilities had a more definite case with regard to their installation charges. In many cases a substantial part of the hire-purchase price might be caused by the installation of electric lines or even, in the case of refrigerators, the provision of concrete let-ins in the floor, and so on. It was felt that such work had no compensation value, and it was conceded that where this expenditure was genuine it should be part payable by the hirer, quite apart from the cost of the original goods.

Mr. Thorne seconded the new clause.

Mr. Ede said that this clause did not entirely satisfy the municipal electricity undertakings, but they were placed in the position that if they put down any amendment in the form they would like it would wreck the compromise on which the Bill had been safeguarded. He could not, in view of the grave abuses that this Bill proposed to rectify, take the responsibility of moving such an amendment. If, however, it should be found that this measure in operation was harmful to the growth of municipal electricity and similar undertakings, he hoped that it would be possible for the Electricity Commissioners or some other appropriate body to promote a small one-clause Bill that would put the matter right.

The Clause was agreed to.

In the Courts

Sequel to Accident

At Wednesbury Police Court last week the Midland Electric Corporation for Power Distribution, Ltd., Ocker Hill, Tipton, was summoned for failing efficiently to protect a high-voltage conductor.

Mr. E. G. Robey, for the Director of Public Prosecutions, said that proceedings were taken under Section 136 of the Factory and Workshops Act for a breach of Electricity Regulation No. 2. On January 18th an accident occurred at a sub-station at Kings Hill. A man named Alec Cadman, whose duties were to keep the sub-station clean and inspect the transformers, went to the sub-station with another man. Cadman had looked into one transformer and went to the second to inspect the inside. There was a report and a flash and Cadman's hand was badly charred, and eventually his index finger had to be amputated. Mr. Robey submitted that the insulating material around the high-voltage cable was not in compliance with the regulations and that the cable earthed itself through the man's hand.

Expert evidence was given in which it was suggested that the insulation material had deteriorated by age and this would not be outwardly visible. Mr. Arthur Ward (barrister), who represented the company, stated that it had a thousand similar transformers in use and had never had an accident before.

The Stipendiary, Mr. B. G. Grimley, decided that the company had infringed the regulations, although no doubt it had done so unwittingly. In view of the company's long immunity from accidents of this type he had decided to deal with the case under the Probation of Offenders Act, and in ordering payment of £10 14s. costs he intimated that he would not record a conviction.

Electrolytic Ammonium-nitrate

AN economic outlet for the surplus oxygen that is produced in the electrolytic manufacture of hydrogen is suggested by a method that has been devised in Russia. The new process involves partial oxidation of ammonia by water, carried on to the stage of ammonium-nitrate production. The combined reaction voltage has been calculated as 0.72 V, while thermodynamic data indicate that the decomposition voltage of water can be decreased in principle from 1.23 to 0.5 V. According to the *Chemical Trade Journal*, a wooden vessel is employed with an asbestos or clay diaphragm and an anode of iron. The electrolyte may be a 16 per cent. ammonium-carbonate solution, or a 10 per cent. potassium-hydroxide solution. The yield is increased by the addition of from 0.9 to 1.0 per cent. of a special catalyst (principally copper hydroxide) made by the interaction of copper sulphate and ammonium-carbonate. The electrolyte is preferably kept in motion and ammonia gas is injected during the water decomposition. Carbon dioxide gas is formed in the liquid and ammonium-carbonate is in all cases probably the actual electrolyte. The average yield of ammonium-nitrate is about 75 per cent., reaching its maximum in about five hours and then decreasing rapidly, probably owing to the precipitation of ammonium-bicarbonate which eventually brings the process to a standstill. The best results are obtained with a hydrogen ion concentration of 8.5 to 8.1; the necessary acidity can be maintained by the addition of nitric acid. No great difference in yield has been noted at current densities between 0.0025 and 0.04 A per sq. cm. Solutions containing 74 per cent. and more of ammonium-nitrate are obtainable continuously when employing 2.8 V, 45 A, with a density of 750 A per sq. m. at a temperature between 20 and 25 deg. C. It is thus calculated that 6,670 kWh produces 776 kg. of ammonium-nitrate and 1,000 cu. m. of hydrogen. Since in ordinary electrolysis about 5,000 kWh yields 1,000 cu. m. of hydrogen, the production of one ton of ammonium-nitrate requires only 2,000 kWh. Contamination from the iron anode does not exceed 0.2 per cent.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The E.C.A. Conference

The twelfth annual conference of the Electrical Contractors' Association (Inc.) and allied associations will be held at Hastings on June 22nd, 23rd and 24th. In the morning of the first day the Council of the E.C.A., N.E.C.T.A., Ltd., and N.F.E.A. will meet at the White Rock Pavilion, Hastings. Delegates to the conference will register at the Queen's Hotel in the afternoon and there will be a reception by the president in the evening, followed by dancing. On the second day the delegates will be accorded a civic welcome at the White Rock Pavilion, after which Mr. H. E. Walker will deliver his presidential address. The conference will reassemble at the White Rock Pavilion in the afternoon, and in the evening there will be a reception at the invitation of Councillor E. M. Ford, Mayor of Hastings. The annual general meeting will be held on the last day at the White Rock Pavilion, following which the new president will be installed and will deliver a short address. A garden party will be held in the afternoon, and in the evening there will be a ball and cabaret at the Queen's Hotel. The form of registration can be obtained from Mr. L. C. Penwill, director and secretary of the Association, Africa House, Kingsway, W.C.2. The conference fees are as follows, and include participation in all social functions.—Members (and their ladies), 15s. per person. Non-members (and their ladies), 30s. per person.

A Guide to the Factories Act

The Factories Act passed last year comes into operation on July 1st. It introduces many changes in the law with which all industrialists must become acquainted and so the publication of "The Factories Act, 1937: Comparative Statement," by the National Confederation of Employers' Organisations is both timely and valuable. This statement sets out the Act very clearly section by section and, in addition to notes which assist in the understanding of the provisions, contains a concise statement of the existing law on the subject. The handbook extends to 200 pages and can be obtained from Millbank House, 2, Wood Street, Westminster, S.W.1, at 2s. 9d. (post free) paper bound, or 4s. (post free) in cloth binding.

An Electric Vehicle Fleet

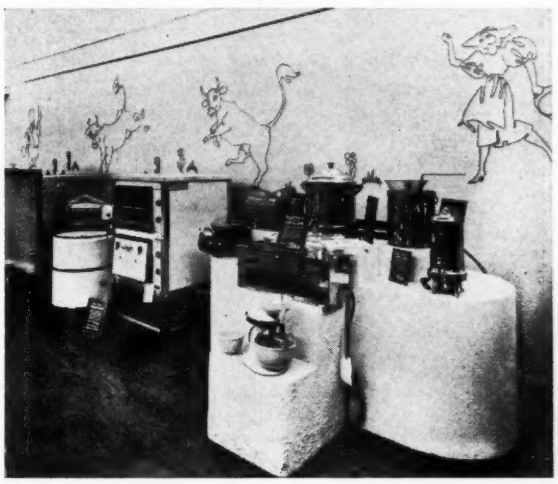
To celebrate the delivery of a fleet of twenty of their electric vehicles to Hovis, Ltd., their Bournemouth agents, on Monday last, Partridge, Wilson & Co., Ltd., held a luncheon and inspection at the Imperial Hotel. At the luncheon the company's works manager, Mr. F. G. Sawyer, mentioned that the time of assembly of one of these vehicles had been reduced to 4¼ hours. The company's policy was to specialise and continually improve upon one type of vehicle. Councillor Langton, chairman of the Bournemouth transport undertaking, welcomed the arrival of the vehicles as a means of preserving the amenities of the

Part of the fleet of Partridge, Wilson electric vehicles delivered to Hovis, Ltd., at Bournemouth

borough. The managing director of the company, Mr. H. G. Wilson, presided at the luncheon. The vehicles are 7-cwt. machines equipped with "Exide-Ironclad" batteries (24-cell, 161-Ah capacity at the five-hour rate) the weight of which is well distributed. A totally enclosed traction type motor is served by means of a Wilson relay interlocking contactor controller which is non-arcing. The chassis frame is of pressed steel with dropped front fitted with riveted tubular and channel torsional members to prevent "weaving" or "lozenging," and the front axle is a steel drop forging of special design. The rear axles are fitted with a high-efficiency spiral bevel type differential which is silent in operation. The chassis is well sprung and a 16-in. diameter steering wheel is provided. Fourteen of the vehicles are to be employed for local delivery work in Southampton. Recently the company received an order for fifty vehicles from a large bakery in Ireland.

Royal Dublin Society's Spring Show

The accompanying illustration shows the stand of the Electricity Supply Board, Dublin, at the Spring Show of the Royal Dublin Society. The display consisted of equipment for hotels



The display of the Electricity Supply Board, Dublin, at the Royal Dublin Society's Spring Show

and milk producers. The display was of particular interest to milk producers as they are now required by law to have sterilising equipment for all milk containers, cans, bottles and the like.

"Talkie" Apparatus for Showrooms

At a meeting on May 2nd the Worksop Corporation sanctioned the installation of a film projector in the electricity showrooms for demonstration purposes. The Corporation has purchased a "Wundatone" machine, manufactured by S.P. Equipments, Ltd., which takes 16 mm. films, either silent or "talkie." The machine has the further advantage of being able to be used in conjunction with a microphone when silent films are being shown.

The F.B.I. Business Forecast

The "Business Forecast" published in the F.B.I. "Business Barometer" for the second quarter of 1938 states that the forecast made last quarter continues unchanged. Probably the outstanding event of the past quarter has been the absence of any real revival in the United States. So long as business in that country continues to be depressed the forces making for a slackening in world trade activity are likely to continue to make headway. So far as this country is concerned the steps which are being taken to secure an acceleration of the rearmament programme should assist in strengthening and still further prolonging the resistance which that programme has already enabled this country to offer to the pressure of cyclical recession.

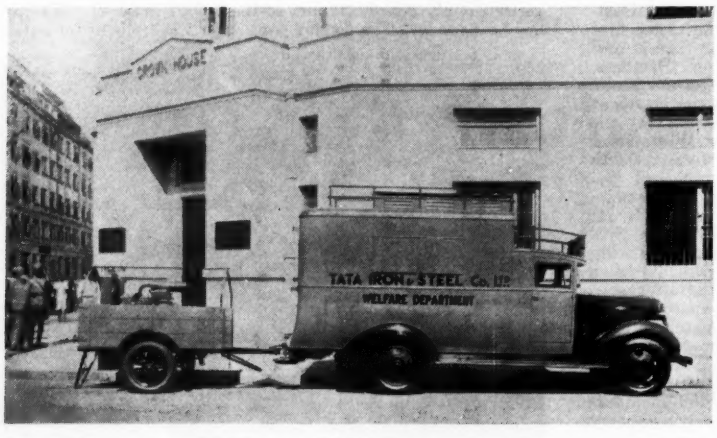
Street Lighting Conference

An electric street lighting conference for supply engineers, organised by the E.L.M.A. Lighting Service Bureau, in conjunction with E.D.A. and the I.M.E.A., was held on May 4th at the Lighting Service Bureau and was attended by 200 engineers from all parts of the country. Sir Cyril Hurcomb (chairman of the Electricity Commission) said that 1,500 miles of streets in this country were lighted with electric discharge lamps. There was a high degree of appreciation on the part of the general public of the advantages of efficient street lighting, not only for the purpose of enhancing the safety of all classes of road users and of promoting a smooth flow of traffic, but also because good street lighting helped to promote an active civic life and induced a sense of security in their surroundings. Local authorities were being led to appreciate the importance of sound technical advice on the subject. There were many miles of street lighting to be brought up to the standards visualised in the Final Report of the Departmental Committee on Street Lighting, and there were many more miles of trunk roads outside purely rural areas which were at present unlighted. The total sales of electricity for street lighting in 1936-37 were just over 300 million kWh, and the 10,000 miles of road which the Departmental Committee regarded as suitable to be lighted to the traffic route standard would require 440 million kWh a year if they were lighted all night by electric discharge lamps. Following Sir Cyril Hurcomb, Mr. N. L. Harris spoke on the development of tungsten

filament and electric-discharge lamps, and Mr. G. S. Lucas surveyed the major points of the Final Report. Mr. J. C. Dalton and Mr. H. A. Phillips spoke on how to secure street lighting contracts.

A Handy Road Map

The publication of a new "Ediswan" road map of Great Britain comes at a very opportune moment, for many delegates to the I.M.E.A. Convention at Torquay will no doubt find it very useful. By means of a special folding arrangement any desired route can be followed on a map that is never more than 18 in. by 9 in. in area, although the scale is 10 miles to the inch, with Scotland at 20 miles to the inch. The latest classification of new trunk and other main roads is employed, together with the principal mileage and road numbers, &c. The map can be obtained through the A.A., the R.A.C. and bookshops and is priced at 3s. 6d.



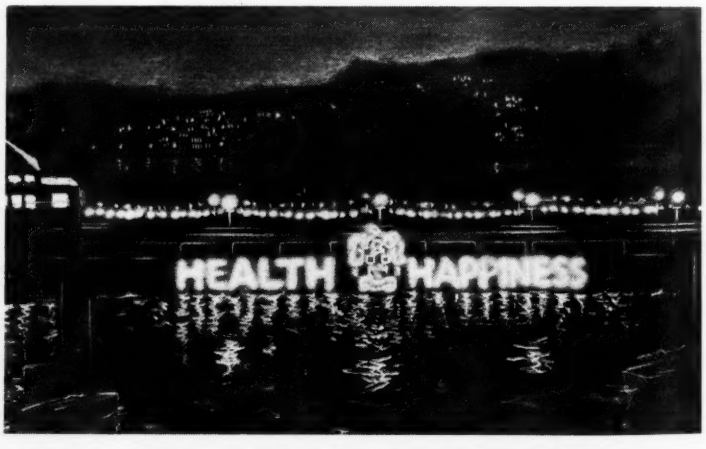
B.T.H. mobile "Talkie" unit in India

Hungarian Electrical Trade

In his report to the Department of Overseas Trade on the economic and commercial conditions in Hungary Mr. R. P. F. Edwards, Commercial Secretary, H.M. Legation, Budapest, states that the total exports of electrical machinery and apparatus during the first nine months of 1937 had a value of 19,405,000 pengös, as compared with 18,298,000 pengös in the corresponding period of 1936, while imports totalled 4,584,000 pengös and 3,610,000 pengös, respectively, during the same periods. Exports to the United Kingdom were 1,547,000 pengös for the first nine months of 1936, and 1,434,000 pengös for the first nine months of 1937. Imports from the United Kingdom were, however, only 86,000 pengös for 1936 (first nine months), and 49,000 pengös for 1937 (nine months).

Spectacular Lighting at Torquay

By painting the harbour side of the Princess Pier with fluorescent media and floodlighting it with invisible ultra-violet radiation, the Edison Swan Electric Co., Ltd., will produce a novel colour lighting effect during the I.M.E.A. Convention at Torquay. The design chosen is the Torquay coat of arms, together with the motto "Health and Happiness." The escutcheon and mantling, which will be constructed as a daylight sign, will be finished with white-lead paints, over which will be coats of invisible fluorescent powders, thus giving the true heraldic colours both day and night. The motto will be invisible in daylight, since it is painted only with fluorescent media directly on to the wall. This, it is believed, will be the first sign of its kind, and the effect will be accomplished by the use of twenty-six "Royal Ediswan" 125-W ultra-violet "black bulb" lamps, housed in elliptical angle reflectors and operated in conjunction with standard chokes and condensers. In addition to this equipment individual transformers will be employed on account of the unusually low a.c. voltage. The reflectors will be spaced at 5 ft. intervals with a projection from the surface of the display of 7 ft. The display is to extend for 128 ft., the coat of arms occupying a space 14 ft. square. The letters of the motto will be 8 ft. high.



An artist's impression of the "Ediswan" fluorescent lighting at Torquay

A Rubber Handbook

The 1938 edition of "Rubber Producing Companies," which is now available, like its predecessors contains essential information for those who are interested in rubber shares. The data includes forward contracts, standard outputs, annual production, sale price, working cost and plant areas, while a feature is the tabulation of results over a number of years. Particulars of about 600 undertakings are given. The handbook is obtainable from the *Financial Times*, 72, Coleman Street, E.C.2, and the Mincing Lane Tea and Rubber Share Brokers' Association, Plantation House, E.C.3 (7s. 6d. net, 8s. post free, or abroad 8s. 1d.).

A Mobile "Talkie" Unit in India

The general education and entertainment of the people in rural districts of India present a difficult problem, particularly as only 7 per cent. can read or write, while villages and towns up to 10,000 population cannot support a cinema and very few of the inhabitants have radio sets. The Tata Iron & Steel Co., of Jamshedpur, Bengal, whose various works cover a wide area and give employment to 20,000 people living in small villages, have therefore recently put into operation a British Thomson-Houston sound-film equipment housed in a motor van, an independent electric generator plant supplying the necessary power for the "talkie" apparatus. By this means weekly shows are given at each village in the open air and attract attendances varying from two to twelve thousand. There are several points of interest in the equipment, which is the latest B.T.H. type complete with projector mechanism, arc lamp, outdoor horn type speakers, &c. For instance, special resilient mounting was necessary to withstand arduous conditions of rough roads and tracks; the van has cavity sides with air circulation by fan between outer and inner walls for cooling purposes; the picture is projected through a glass sealed porthole to keep out the hosts of greenflies and insects attracted by the arc light—particularly just before the rainy season; and the "screens" used are large permanent concrete erections painted white. The equipment was supplied through the Associated Electrical Industries (India), Ltd., and installed by their technical engineer, Mr. B. B. Ray.

Orders Recently Booked

In connection with the extensions in progress at the Hartshead generating station of the Stalybridge, Hyde, Mossley and Dukinfield Transport and Electricity Board, an order has been placed with the Hackbridge Electric Construction Co., Ltd., for two large reactors to limit the magnitude of fault power between a new bank of 750-mVA switchgear (to which will be connected the new 30,000-kV alternator) and the existing 500-mVA switchgear. The reactors are of the magnetically shielded, oil-immersed type, constructed for outdoor operation and were designed with a view to economy of floor space. They are each of 15,000 kVA normal capacity, operate on a 6.6-kV, three-phase, 50-cycle system, giving 6 per cent. reactance, and are each capable of withstanding a maximum short-circuit value of 250,000 kVA for 10 seconds. The contract is interesting as an example of the extensive use which is now made of this type of plant for the protection of transmission systems under the severe fault conditions associated with modern large-capacity generating plant, and is typical of a number which has recently been executed by the Hackbridge Co.

Bennie Lifts, Ltd., has secured the contracts for the installation of three goods and one passenger lift at the new Speke Airport, Liverpool, and the two goods lifts at the premises of M. Littlewoods, Liverpool Other orders include two high-speed heavy goods lifts for the Navy, Army and Air Force Institute warehouse, which is being built at Kennington, in addition to a repeat order from the proprietors of Hay's Wharf, Ltd., for a 2-ton goods passenger lift.

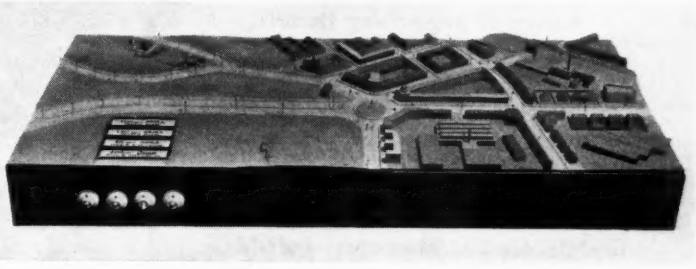
United Engineers, Ltd., has recently supplied 156 Crompton Parkinson distribution type ceiling fans to the General Hospital, Penang. The order, carried out to the specification of the electrical engineer to the Straits Settlement Government, also called for over 600 Crompton lamps and for a mains board

comprising eight "Klad" units on a 400-V system for controlling the entire hospital. It is made up of three units of 75 A capacity covering the lighting, one spare unit, two power units each of 150 V capacity, and two incoming units each of 300 A. At the pumping station at Penang aerodrome there has been installed a 60 h.p. Crompton motor and control gear belt driving a Worthington Simpson pump with a capacity of 7,000 gal. per min. The Federated Malay States Government placed a contract through United Engineers, Ltd., for Crompton Parkinson equipment for the Government power station at Kuala Lipis. This equipment includes two 75-kW open-type, three-phase, reversing field alternators, a five-panel open flat back type high-voltage switchboard and one l.v. panel.

A Street Lighting Model

The recommendations in the Ministry of Transport's Final Report on Street Lighting have been effectively illustrated by a model produced by the General Electric Co., Ltd. This shows many of the problems which may be met and also their correct treatment as recommended by the Ministry. It consists of two parts—a realistic system of streets bounded by houses, cinemas and factories, and photographs specially chosen to illustrate the more important features demonstrated by the model, and suggested in the recommendations. As far as possible the street lighting examples have been modelled from actual installations. The model measures 5 ft. long by 2 ft. wide. the lighting columns, roads and spacing between columns being to a scale of 1 ft. to 380 ft. Running the whole length of the model is a main arterial road. This is lighted by columns providing a mounting height, to light source, of 25 ft. After the roundabout the country becomes more open, and the road is made into a dual carriageway, the central reservation at the beginning being over 6 ft. broad. Branching from the roundabout on the model is another road which shortly divides into two, the major portion becoming an S bend. Round this bend the spacing becomes very close. Opposite this fork and on the inside of the bend is a lantern which serves to indicate to the side-road traffic that a major road lies ahead. Examples of this are illustrated in other parts of the model. The distinction between main traffic routes and Group B roads lies in the mounting height provided for the lanterns, main routes having a mounting height of 25 ft. and Group B roads only 13-15 ft. This difference is clearly shown on the model.

Cross-road lighting treatment is also shown in several places. The model has been installed in the central showrooms at the G.E.C. Headquarters at Magnet House, Kingsway, London, W.C.2.



A model produced by the G.E.C. showing the correct methods of street lighting as recommended by the Ministry of Transport

Social Events

Two productions have recently been presented by the Century Players of Elliott Brothers (London), Ltd. The first show, by the Dramatic Section, was Harold Pointer's comedy, "Honour thy Father." This was well done for an amateur performance and was produced by Mr. S. A. Hawkes. The second show, by the Musical Section, took the form of "Variety," and some excellent turns were given. The show

was produced by Messrs. G. Doyle and C. E. Osborne and compered by Mr. R. W. Griffin, one of the sales representatives. Each show was given at the S.E. London Technical Institute on two successive evenings. All the players were members of the office or factory staff.

The second golf challenge match between members of the electrical industry of Liverpool and Manchester districts was held at Sandiway Golf Club, Cheshire, on May 4th. A perfect day's golf, under ideal weather conditions, was enjoyed. The result was a win for Manchester with 14½ matches to 9½ matches. During the subsequent dinner, at which Mr. J. H. Farthing (a director of the G.E.C.) presided, it was resolved that the meeting should be an annual function. The chairman offered to present a trophy to be competed for and the arrangements for the 1939 meeting were left in the hands of a committee, Mr. Farthing being elected chairman. Mr. B. T. Hawkins (borough electrical engineer of Wallasey) proposed a vote of thanks to the Sandiway Golf Club for their admirable arrangements both on the course and in the clubhouse, and Mr. C. Bridgen (Ferranti, Ltd.), thanked the chairman, who briefly responded.

The First Football XI of the Works' Club of William Geipel, Ltd. (the Geipel Cables Sports Club), has just completed a successful season. This team, which plays in the premier division of the Harrow and District League, won the League challenge cup and the Harrow charity cup. The team also reached the final round of the Wembley hospital cup, of which they were the holders, but were narrowly beaten by Sudbury St. George's by 3-2. In addition to these cup finals the team also finished third in the League.

The B.E.A. Handbook

The 1937 edition of the "Classified Handbook of Members and their Manufactures," issued by the British Engineers' Association, like its predecessors, is a useful guide to engineering products of this country. In addition to an alphabetical list of members there is a classified section of members' products by trade headings. Particulars of the objects and activities of the Association and conditions of membership are also given. The publication is being distributed to selected buyers in the home and overseas markets and will be posted free of charge to anyone interested in the purchase of British engineering plant, machinery or accessories, on application to the Secretary of the Association, 32, Victoria Street, London, S.W.1.

Electricity Supply Rifle League

As a result of the matches for the opening month of the season of the Electricity Supply Rifle League the following are the leaders in their respective divisions:—Division I: Shoreditch. Division II: City "B." Division III: J.E.A. (Twickenham). Division IV: Gravesend.

Belgian Electrical Showrooms

An unusual showroom for the sale of electrical appliances has been erected by Govaerts and Van Vaerenbergh for the Magec concern of Brussels. The premises consist of a three-storey building and include a display of appliances, a restaurant, and a lecture hall for demonstrations. The entrance to the ground floor is set rather far back so that visitors must pass along the windows on each side. Inside the building there is a large display room with balconies at the mezzanine and first floor levels, which permit visitors to see the various departments at a glance. Each floor is given over to a different department, thus permitting the customer to see all of the stock in a particular line. In the basement is the larger apparatus for heating, laundries, &c., while on the ground floor and on the mezzanine above it the display is confined to cooking appliances. The first and second floors display appliances for which there is a smaller demand. The entrance to the restaurant is at one side of the building. The exit, however, is by the showrooms, so that those using the restaurant are obliged to pass through them to leave. Another interesting point is that the kitchens are public, being situated in the show windows on the mezzanine floor so that one can watch the meals being prepared from the street. A lecture hall on the second floor is used for cookery demonstrations, and is provided with a series of demonstration kitchens at each side of the speaker's platform so that a series of dishes can be prepared.

The exterior of the new electrical showrooms of the Magec concern in Brussels

An Electric Crematorium

On June 21st the foundation stone of the new Mortlake electric crematorium will be laid. The two electric furnaces, which will cost £4,000, are being made by Birmingham Electric Furnaces, Ltd. Work on the building itself began on April 4th.

South African Municipal Year Book

The 1937-38 edition of the "Official South African Municipal Year Book" (London agents: E. G. Allen & Son, Ltd., price 25s.), which is now available, is a comprehensive guide to municipal affairs in South Africa. The particulars in the electrical and engineering sections are much more comprehensive than those published previously. Data relative to municipalities and local bodies have been revised and the comparative statistics relating to finance, populations, tramway undertakings, water supply, electricity supply, engineering data and motor transport form a complete reference to the whole of South Africa. Particulars are also given of overseas loan flotations by South African municipalities.

Local Exhibition

At a Health and Fitness Exhibition held at the Winter Gardens at Deal from May 4th to 7th by the Deal Traders' Exhibition Association, the South East Kent Electric Power Co.'s stand near the main entrance became the centre of interest of a large number of visitors. The company's exhibit comprised a display of electric cookers, water heaters, refrigerators, and other domestic appliances, and at frequent intervals there were demonstrations of electric cooking.

Survey of Engineering Exports

The *British Engineers' Export Journal* has produced a very comprehensive survey in which British engineering exports to 112 countries are tabulated under about 80 different headings. The value of the classified exports reaches the total of £36,075,000, electrical machinery leading with £8,673,000. Manufacturers and exporters will find it an exhaustive and reliable guide to the many categories of engineering exports upon which to base their plans for future development. Produced in handy folder form, the analysis is priced at 10s. 6d., post free.

New Huddersfield Showrooms and Offices

On Wednesday last the new showrooms and offices of the Huddersfield Corporation Electricity Department were to be formally opened by Sir Cyril Hurcomb, chairman of the Electricity Commission. In 1893 a public electricity supply was inaugurated in Huddersfield with a plant capacity of 250 kW, whereas the new plant and boilers now in course of construction at the present station will have a capacity of 20,000 kW. The maximum load on the undertaking in 1937 reached 33,610 kW, an increase of 3,000 kW on the previous year, and the number of consumers exceeded 42,000, of which 2,357 were connected during the year, the sales totalling 91,278,903 kWh. The first showroom and office was opened thirty years ago, and was subsequently extended. These premises, however, have long been inadequate and when the old building and site in Market Street on which the new premises stand became available the Electricity Committee together with Mr. E. Lunn, the borough electrical engineer, decided that the site was suitable for their requirements. An impression of the ample accommodation which has been provided can be obtained from the accompanying illustrations. The main entrance to the showrooms takes the form of a wide vestibule, with doors on each side of a non-reflecting window through which a view of the spacious ground floor lounge hall is obtained. The display room on the first floor contains a comprehensive range of lighting fittings, cookers, wash boilers, refrigerators, radiators and other appliances, while surrounding the main room on this floor are a model kitchen, bathroom, bedroom, lounge and demonstration kitchen, together with a lecture hall and conference room. The various offices are on the second floor, while the third will accommodate meter-testing apparatus, drawing office, messroom and canteen, in addition to stores. The heating of the building is by a thermal storage system which comprises a 140-kW electrode boiler in conjunction with a storage cylinder. Panel heating in the ceilings of all the rooms provides a controlled radiant heat. A special feature on the ground floor is a room devoted to the demonstration of lighting faults with comparisons, which will assist consumers in the better lighting of their homes and factories. Synchronous clocks are installed throughout the building. We hope to publish a report of the official opening ceremony in our next issue.

Norwich E.D.A. Circle

Members of the Electrical Development Circle at Norwich attended at the Duke Street headquarters on May 3rd to hear a lecture on "Industrial Lighting as Affected by the Factory Acts." The lecturer, Mr. F. L. Cator, of the British Thomson-Houston Co., Ltd., considered that light-sensitive cells, as used in U.S.A., would be increasingly employed in this country in the future. Lantern slides were shown and technical points elucidated. Mr. R. W. Steel, A.M.I.E.E., presided.

Trade Announcements

The address of the General Electric Co. (India), Ltd., has been changed to Magnet House, 502, Merchant Street (P.O. Box 234), Rangoon.

Goodliffe Electric Supplies, Ltd., is removing on May 16th to a new works at Purley Way, and from that date the name and address of the company will be:—Goodliffe Electric Co., Ltd., Goodtric Works, Purley Way, Croydon (telephone: Croydon 6672). The company has decided to drop the word "Supplies" from its name.

The Rotary Engineering Co., wholesale distributors of electrical accessories and power plant, is removing to 27, Douglas Street, Glasgow (telephone: Central 5926/7), where it is also opening a new showroom. The goods entrance is at 25, Douglas Street.

Following upon the recently announced change in manufacturing policy, Elexcel, Ltd., has decided to concentrate all sales and service activities at its head office, Victor Works, Broad Green, Liverpool, 14. Correspondence, &c., formerly handled by district offices in London, Bristol, Manchester, Birmingham, Glasgow and Leeds will now be dealt with by the head office direct.

Australian Electrical News

At the annual conference of the Australian Electrical Engineers Association held in Sydney the secretary (Mr. G. W. Stewart) remarked upon the number of dangerous electrical toys now on the market. These, he said, included small electrical ranges for plugging into 240 V, and unfortunately there was no legislation to prevent their sale. In his opinion no toys of any kind should be used on 240 V as they could not be made safe.

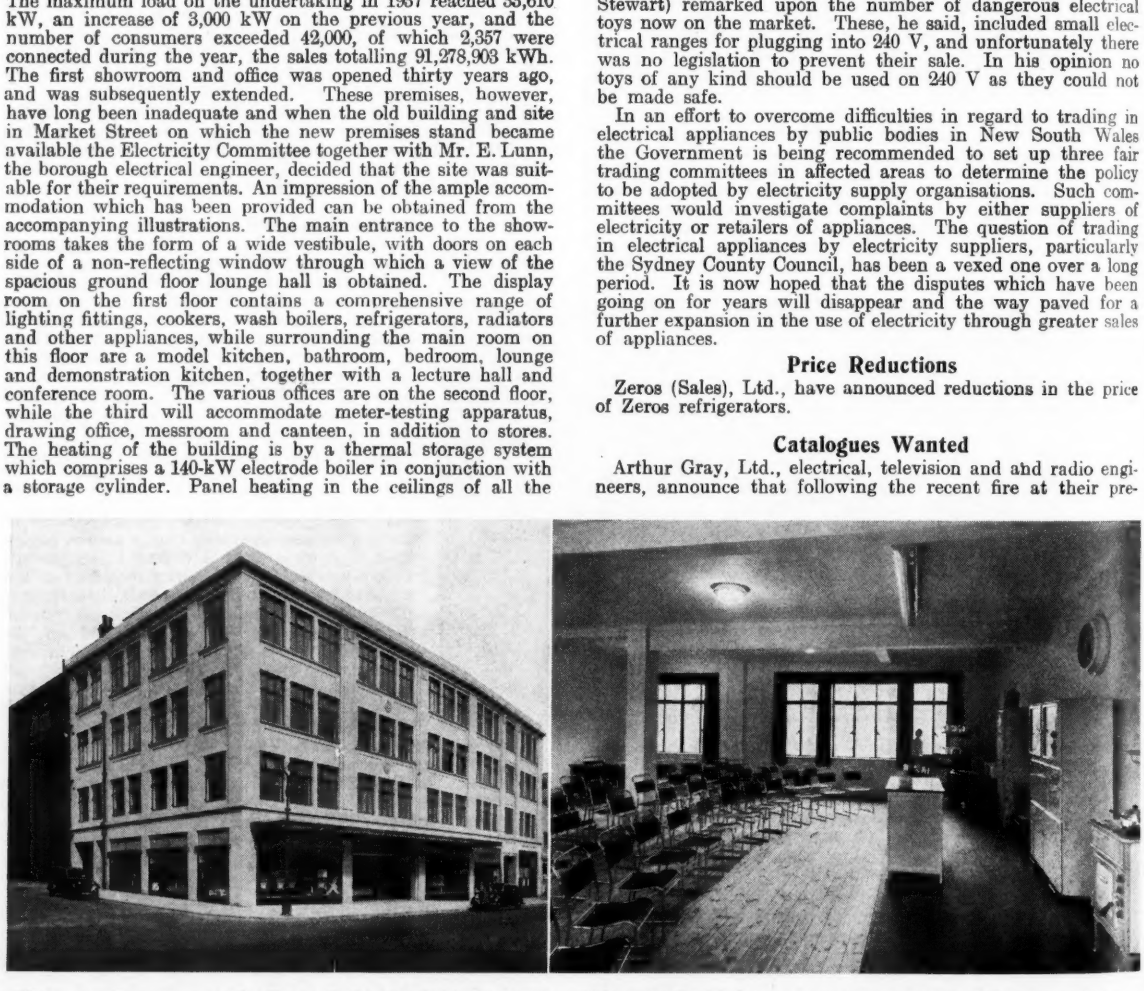
In an effort to overcome difficulties in regard to trading in electrical appliances by public bodies in New South Wales the Government is being recommended to set up three fair trading committees in affected areas to determine the policy to be adopted by electricity supply organisations. Such committees would investigate complaints by either suppliers of electricity or retailers of appliances. The question of trading in electrical appliances by electricity suppliers, particularly the Sydney County Council, has been a vexed one over a long period. It is now hoped that the disputes which have been going on for years will disappear and the way paved for a further expansion in the use of electricity through greater sales of appliances.

Price Reductions

Zeros (Sales), Ltd., have announced reductions in the price of Zeros refrigerators.

Catalogues Wanted

Arthur Gray, Ltd., electrical, television and and radio engineers, announce that following the recent fire at their pre-



The new showrooms and offices of Huddersfield Corporation Electricity Department, showing (left) the imposing exterior and (right) the lecture room

mises at Gray House, 150, Charing Cross Road, W.C.2, they are continuing trading at the same address on the first floor, and ask for literature on manufacturers' products.

Inauguration of New Plant at Manchester

The new 51,500-kW turbo-generator to complete the second and final extension of the Barton power station of the Manchester Corporation (a description appears on page 673) was formally started up by Sir Leonard Pearce, C.B.E. (chief engineer of the London Power Co. and formerly chief engineer and manager Manchester Corporation Electricity Department, 1904-25) on May 10th. More than 300 guests subsequently attended a celebration luncheon at the Town Hall. They included the Mayors of three municipalities, five chairmen of urban district councils, representatives of the C.E.B., large power consumers, electrical contractors and associations connected with the industry. Ald. R. W. Shepherd (chairman of the Manchester Electricity Committee) paid tribute to the far-sightedness of Sir Leonard when in 1923 he designed and planned the construction of the original portion of the Barton station. In 1925, the kWh generated totalled 333¼ million, whereas in the year to March 31st last the total was 898¾ million kWh, while the number of consumers had increased from 34,080 to 170,260. Sir Leonard Pearce said that great advances had been made in the size of generating plant as well as in steam pressures and temperatures, and the thermal efficiency had increased by 40 to 50 per cent. since 1920. Ten years ago the average coal consumption was 2½ lb. per kWh generated; that figure had been reduced to 1¼ lb., an improvement of 60 per cent. Advances in technique were going a long way to counteract the rise in coal prices and the limits in efficiency had by no means been reached. There was much that might be done by engineers and architects, working in co-operation to produce more artistically designed power station buildings. Speeches were also made by the Lord Mayor and Coun. C. F. Terry (deputy chairman of the Electricity Committee). Following the luncheon the Lord Mayor opened the new electricity showrooms in the Town Hall extension. We hope to describe and illustrate these in our next issue.

Preserving Wood Poles

We regret that owing to a typographical error in our issue of April 22nd the year of Professor Kyan's experiments with sublimate of mercury for preserving wood poles was given as 1932 instead of 1832.

Prices of Materials

Henry Gardner & Co., Ltd., report, May 11th: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 15s., 5s. increase. Spelter, £13, 7s. 6d. increase. English block tin, £168, £14 15s. increase. Mercury, no change.

Frederick Smith & Co. report, May 11th: Electrolytic copper bars, £43 10s., 5s. decrease. Ditto, ditto, wire rods, no change. Ditto, ditto, h.c. wire, 7¾d., 1/16d. decrease. Silicium bronze wire, 8¾d., 1/16d. decrease.

Edward Till & Co. report, May 11th: India rubber, Para fine, no change.

New Catalogues and Lists

Alliance Wholesale, Ltd., 62, Great Russell Street, London, W.C.1.—In an illustrated 160-page catalogue of electrical accessories, conduit, industrial lighting fittings, switchgear, fans, lamps, &c., are dealt with.

Ferranti, Ltd., Moston, Manchester, 10.—A leaflet dealing with all-mains, all-wave superheterodyne receivers.

Drayton Regulator & Instrument Co., Ltd., West Drayton.—A guide to the construction, operation and principal advantages of the Drayton Armstrong steam trap.

British Insulated Cables, Ltd., Prescot.—Catalogues dealing with paper dielectric and electrolytic condensers (pp. 23), magnetic moulding machines (pp. 28), and overhead equipment for tramway and trolley-bus lines (pp. 92). Also a leaflet dealing with segmental cables and a booklet on radio materials (pp. 40). All are well illustrated.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—A profusely illustrated catalogue of metal-clad, oil-break switchgear.

Tok Switches, Ltd., Cambridge Row, Burrage Road, Woolwich, London, S.E.18.—An illustrated catalogue of rotary switches.

Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.—A leaflet dealing with a portable CO_2 temperature indicator.

Berry's Electric, Ltd., Touchbutton House, Newman Street, London, W.1, has produced a brochure illustrating in colour the effects of the "Chameleon" all-the-year-round colour-changing fireplace.

Mayer, Newman & Co., Ltd., 51, Farringdon Road, London, E.C.1.—A leaflet dealing with small domestic appliances.

Midland Electric Manufacturing Co., Ltd., M.E.M. Works, Reddings Lane, Tyseley, Birmingham, 11.—Leaflets giving details of improved and re-instated 5-way fuseboards, neon sign switches, "Memway" fuseboards and "Memten" switch fuses.

Crompton Parkinson, Ltd., Bush House, London, W.C.2.—An illustrated brochure in photogravure dealing with the production of electric motors at the company's Guiseley factory.

Elliott Brothers (London), Ltd., Century Works, Lewisham, London, S.E.13.—Details of a new surge-proof leakage recording ammeter.

Sturtevant Engineering Co., Ltd., 147, Queen Victoria Street, London, E.C.4.—A booklet dealing with propeller fans.

Airedale Electrical & Manufacturing Co., Ltd., Macta Works, Low Moor, Bradford.—A complete catalogue of control gear for electric motors.

Bankruptcy Proceedings

W. E. Sparrow and **F. Sparrow,** carrying on business under the style or firm of Sparrow & Co., 8, Longsmith Street, Gloucester, electrical contractors.—A further hearing of this public examination took place recently at the Shire Hall, Gloucester. At the previous hearing the statement of affairs disclosed gross liabilities of £2,067, of which £1,321 was expected to rank for dividend, with assets of £354, leaving a deficiency of £967. The failure was attributed to lack of capital and losses on contracts through lack of supervision. The examination had been adjourned to enable the debtors to file a cash account for a period of three years immediately preceding the bankruptcy. The Deputy Official Receiver stated that he had only recently received the cash account and had had little opportunity of checking the accounts and he suggested that if the examination were closed the signing of the notes should be delayed for a time to enable him to check the accounts. The Registrar closed the examination on those terms.

A. T. White, Radio House, High Street, Hadlow, Kent, electrical engineer.—This debtor filed his own petition and he has lodged a statement of affairs showing gross liabilities of £825. Of that amount £798 is expected to rank for dividend, with net assets of £345, leaving a deficiency of £453. Debtor attributes his failure to lack of capital and slump in trade caused by local depression. At the first meeting of creditors a resolution was passed appointing Mr. A. E. Orbell, accountant and auditor, 6-7, Old Steine, Brighton, as trustee of the estate, with a committee of inspection.

R. M. Jones, radio dealer, 40, Lordship Lane, East Dulwich, S.E.—This debtor's public examination was concluded at the London Bankruptcy Court on May 5th before Mr. Registrar Kean. The debtor told the Official Receiver that his liabilities amounted to £506 while he estimated his assets to realise £255. In consequence of customers leaving the neighbourhood, and keen competition, his net profits had been insufficient to meet his drawings and his endeavours to find a purchaser for the business were unsuccessful. As he was unable to meet his obligations as they became due, he filed his petition.

J. N. Waring, electrical engineer, Sandland Street, Bedford Row, W.C., and Grangecliffe Gardens, Sydenham.—The public examination was held on May 3rd before Mr. Registrar Parton at the London Bankruptcy Court. The accounts showed total liabilities £2,622 (ranking £1,942) and assets consisting of stocks, shares and book debts all of uncertain value. The examination was concluded.

J. Shapero, electrical engineer, Kingsland Road, E., trading as General Electrical Engineering Co.—An order of discharge subject to a suspension of six months was granted to this debtor on May 3rd at the London Bankruptcy Court. The Official Receiver reported that the liabilities amounted to £875, the assets realised £104 and a dividend of 9¾d. in the £ was paid.

B. A. E. Hinkins, radio dealer, 322, Torquay Road, Paignton.—Discharge suspended for six months until October 12th, 1938.

W. H. Ashby (Wireless Supply Stores), radio dealer, lately trading at 2A, Shepherds Bush Green, W.12.—Receiving order made April 29th on a creditor's petition. Public examination June 15th at Carey Street, W.C.

R. H. Watkin (Cornish Radio Exchange), radio dealer, 100, Trelowarren Street, Camborne, Cornwall.—Receiving order made April 28th on debtor's own petition.

R. J. Horton, electrical engineer, 204, Coldharbour Lane, Brixton, London.—Application for discharge to be heard on May 26th at Carey Street, W.C.2.

C. J. Tann, radio engineer, "Brianscot," Station Road, Wooton, I. of W., previously trading with another at 87, High Street, Newport, I. of W.—Trustee, Mr. A. L. Medcalf, 87, High Street, Portsmouth, Official Receiver, released April 20th.

Company Liquidations

Green Radio, Ltd.—Winding up voluntarily. Joint liquidators, Mr. L. C. E. Webber, 14, Moorgate E.C., and Mr. A. J. Pope, 1, Chapel Row, Queen Square, Bath.

Standard Radio Relay Services, Ltd.—Meeting June 10th, at Bush House, London, W.C.2, to receive an account of the winding up by the liquidator, Mr. W. C. Thornton Cran.

Farr's Electric, Ltd.—Winding up voluntarily. Liquidator, Mr. T. H. Williams, 326, Romford Road, Forest Gate, E.7. A declaration of solvency has been filed.

May's Radio, Ltd.—Winding up voluntarily. Liquidator, Mr. L. Grahame, 46a, Finsbury Square, E.C.2.

J. Sharp & Co. (Prestwich), Ltd.—Particulars of claims by June 14th to the liquidator, Mr. G. W. Street, 33, Blackfriars Street, Manchester.

Russell's Radio, Ltd.—Meeting June 14th at 9, Wood Street, Bolton, to receive an account of the winding-up by the liquidator, Mr. J. Barlow.

Private Arrangements

A. Roddam, Grendon, Chilton Buildings, near Ferryhill, and Coundon Radio Stores, Collingwood Street, Coundon, radio dealer, &c.—The creditors met recently at the offices of Alan J. Gray & Co., Newcastle-on-Tyne, when a statement of affairs was submitted which showed ranking liabilities of £1,120. In addition there were fully secured creditors for £296. The net assets were £253, leaving a deficiency of £867. In the absence of any offer it was decided that the matter should be dealt with under a deed of assignment to Mr. A. J. Gray. A committee was also appointed.

F. Arrowsmith, 34, Great Moor Street, Bolton, and at Blackburn, Bury and Accrington, radio dealer.—A meeting of the creditors was held at Manchester on May 2nd, when a statement of affairs was submitted showing liabilities of £2,293, all due to unsecured creditors. There were also fully secured creditors for £1,471 holding security valued at £1,587. The net assets were £1,226, leaving a deficiency of £1,067. It was resolved that the estate should be administered under a deed of assignment to Mr. A. O. Miles, of 28, King Street, London, E.C., and another, as joint trustees.

Electricity Supply

Lighting, Domestic, Power

Australia.—SYDNEY SUPPLY UNDERTAKING'S PROGRESS.—An increase in the use of electricity for industrial and domestic purposes is revealed in the figures for 1937, particularly in the domestic field for cooking and water heating. During the year 2,328 cooking ranges and 942 hot-water systems were installed in residences. The industrial load, especially in the secondary industries, also showed a substantial gain, states the *Electrical Engineer and Merchandiser*. At December 31st 240,100 consumers were connected, an increase of 9,192, and sales of

The floodlighted pedestrian crossing at Islington, N., referred to on the next page

electricity were 52,791,470 kWh or 11.45 per cent. greater than for 1936. The general manager estimates that the increased consumption this year will be at least 8 per cent. The change-over from d.c. to a.c. in the central city area is still being carried out and it is proposed to accelerate the work. An expenditure of approximately £1,500,000 on the conversion and other new works is to be made during the year.

Barnsley.—ELECTRIC TOWER WAGON.—The Electricity Committee is to purchase an electric tower wagon costing £680.

Barrow-in-Furness.—MAINS.—A high-voltage feeder is to be laid and a kiosk built in Hibbert Road at an estimated cost of £1,051. Although it was originally proposed to lay an extra high-voltage main from Buccleuch Street to the Locomotive Works, this main is now to be laid from Buccleuch Street to Michaelson Road sub-station, at an additional estimated cost of £379, thus increasing the application for borrowing powers to £21,627. At a cost of £5,500 the Electricity Committee is to extend its mains to houses now being erected in Delhi Street (24), Alfred Street (24), Schneider Road (49), Hollow Lane Estates (143), Vulcan Estate (124), and Jesmond Avenue (42), and Ladycroft Cottage, Aldingham. For other mains extensions the Electricity Committee is seeking sanction to borrow £22,000.

DUPLICATE SUPPLY.—The Corporation is to provide a duplicate supply to the High Carley sanatorium costing £888.

Blackpool.—SUPPLY TO BRICKWORKS.—The Town Council is to afford a supply of electricity to the brickworks of R. Fielding & Sons, Warbreck Hill Road.

Blaydon-on-Tyne.—INQUIRY.—The Minister of Transport has held an inquiry into the Urban District Council's refusal to permit the erection of overhead lines at Polmaise Street and Stella by the North-Eastern Electric Supply Co., Ltd.

Bournemouth. — ELECTRICITY CHEAPER. — The flat rate for electricity has been reduced from 4½d. to 4d. per kWh.

Brighton.—SUB-STATION.—The Corporation proposes to build a sub-station costing £4,220 on the Withdean Estate West.

Bristol.—LOANS.—The Electricity Committee is seeking sanction to borrow an additional £35,000, making a total of £410,664, for the third instalment and £30,000, making a total of £576,068, for the fourth instalment, in connection with the Portishead generating station.

Buckingham.—STREET LIGHTING.—The Council has entered into a ten years' agreement with Northampton Electric Light and Power Co., Ltd., for street lighting at Buckingham and Gawcott.

Cardiff.—STREET LIGHTING.—In connection with the proposed conversion of the street lighting from gas to electricity, demonstration lamps are being erected by both the gas and electricity undertakings.

MAINS.—The Electricity Committee is to extend mains at a cost of £1,016, and is seeking sanction to borrow £50,000 for mains and services.

Cheshire.—EXTENSIONS TO HARTSHEAD POWER STATION.—The Stalybridge, Hyde, Mossley and Dukinfield Joint Electricity Board has approved an agreement with the Metropolitan-Vickers Electrical Co., Ltd., for turbine and auxiliary plant for the extensions to Hartshead power station.

SUPPLY AGREEMENT.—The Board has also entered into a supply agreement with the Calico Printers' Association with regard to Waterside Mill, Hadfield.

Chesterfield.—LOANS.—The Electricity Committee is seeking sanction to borrow £30,000 for mains and services and £10,000 for meters.

China.—JAPAN'S ELECTRICITY PLANS.—Plans for Japanese companies to take over the electricity supply in China are reported to be steadily progressing, and the Japanese Official Press reports that twenty Japanese electric power companies have combined to form the China Electrical Industry Co. to control the electricity services of North and Central China. A Sino-Japanese undertaking with a capital of 4,000,000 yen will be established in Tsinan. The Japanese side will be represented by the North China Electric Co. and the China Development Co. Initially a 20,000 kW steam plant will be established. The Eastern Hopeh Electric Co., a semi-Japanese concern capitalised at 2,000,000 yen, will buy out the Shankaikwan Electric Co., while the purchase of the Tsanghsien Electric Light Co. is also being considered. A concern called the Mongolia-Sinkiang Electric Company will be founded as a Mongolian-Japanese joint undertaking. Half its capital of 6,000,000 yen will be subscribed by the North China Electric Co. and the Central Development Co. Now that the North China Electric Co., a joint subsidiary of the five largest Japanese electric companies, has expanded its activities to provinces other than North China, it will be reorganised and renamed the East Asia Electric Co. A number of Japanese power companies other than the "Big Five" will also be allowed to participate.

Chiswick.—TARIFF ALTERATION.—As the present lighting charge of 4½d. per kWh up to a certain consumption and 2d. per kWh for all in excess does not work out fairly for all consumers, a flat rate of 4d. per kWh for lighting is to be substituted as from the June quarter meter readings.

Colchester.—OVERHEAD LINES.—Subject to the Minister of Transport's permission to erect overhead wires, the Town Council is to provide low-voltage distribution in Cavendish Avenue, Old Heath, and Bromley Road, Elmstead Market.

SUB-STATIONS.—The Town Council has received sanction to borrow £3,376 for sub-stations at Ipswich Road, Colchester, and Prince Albert Road, West Mersea.

SUPPLY DEVELOPMENTS.—In order to improve the town's supply next winter, the Town Council has authorised a scheme for supplying electricity to Reed Hall, Menin Road, and other War Department premises at a cost of £3,606.

STREET LIGHTING.—The Town Council is to apply for sanction to a loan of £4,132 for improving the lighting in Crouch Street, Lexden Road, Military Road, Mile End Road, and Bergholt Road. A further scheme for improving the lighting of Brook Street, Butt Road, Bourne Road, Drury Road, Dugard Avenue and Layer Road is to be considered.

Denmark.—NEW STEAM-OPERATED POWER STATION.—A new steam-operated power station is in course of construction at Isefjord to cover peak-load requirements of the power supply to Seeland, the principal island of Denmark. Hitherto the load has been met by the power stations in Copenhagen and Frederiksberg as well as by the submarine cable connection from Sweden bringing power from Swedish hydro-electric stations. However, only surplus power can be obtained from Sweden, and, in dry years, the amount of "export" power available from that country is very small. It was therefore decided to build a stand-by steam-operated power station at Isefjord, the centre of power distribution on the Island of Seeland, outside Copenhagen. The first stage of development of the new station comprises two turbo-generators each developing 34,000 kW at 3,000 r.p.m. with a future second stage of development comprising a 50,000-kW turbo-set. The two 34,000-kW sets, with the outdoor step-up transformers with a ratio of 6,750/52,000-57,000 V at 50 cycles, have been supplied by the Brown Boveri Co. The two main transformers, each of 35,000 kVA, are being constructed for outdoor erection, each having an oil-cooler of the ribbed-tube type, with an electric-motor-driven fan and oil circulation pump.

As the new station will only be called upon to operate for about 3,000 hours per year, single-cylinder turbines with double-ended low-pressure part were chosen as being the most suitable. Each turbine is built for direct coupling to a three-phase generator with built-on exciter. The turbines are each provided with two oil coolers, of which one can be cleaned while the other remains in service. Each of the two sets is designed for an output of 35,000 kVA at a power factor of 0.85 and a terminal voltage of 6,750 V, 50 cycles. At no load the stepped-up voltage can be regulated down to 49,000 V by varying the shunt excitation of the exciter and without using taps on the main transformer.

East Ham.—TARIFF MODIFICATION.—As an alternative to the ordinary lighting rate, slot meter consumers have the option of being charged on the "1d. per kWh" rate where they have a cooker or water heater, and the Electricity Committee has found is advisable to limit the slot meter collection to these two rates and to require those consumers who desire to be charged on the domestic tariff to transfer to a quarterly account, existing slot meter consumers on domestic tariff being allowed to continue on that system.

Eccles.—SUB-STATION EQUIPMENT.—The Electricity Committee is to prepare a scheme for superseding existing obsolete switchgear and providing new equipment in sub-stations. A loan of £3,000 for sub-station equipment is being applied for.

STANDBY CINEMA SUPPLY.—An application has been received by the Electricity Committee for a standby supply of electricity at the Palladium Cinema.

Eston.—LOAN.—The Urban District Council is to borrow £2,000 for consumers' electrical apparatus, £3,000 for meters, and £500 for wiring installations.

Faversham.—STREET LIGHTING.—The Kent Electric Power Co. is to be asked for its terms for street lighting in Ashford Road.

Gardenstown (Banffshire).—CANVASS.—The Grampian Electricity Supply Co. is carrying out a canvass of the village to ascertain what demands might be expected for electricity, and has also communicated with the County Council regarding the possibility of obtaining a public lighting contract.

Gateshead.—GENERATING PLANT.—The Town Council is to provide plant for generating electricity at the new General Hospital.

Grimsby.—EXTENSIONS.—An electricity supply is to be given to Saltfleetby.

Ilford.—LOANS.—Sanction has been obtained to borrow £10,000 for wiring installations, £5,660 for mains, and £5,000 for sub-station plant.

India.—SIND.—A scheme for the electrification of the rural areas of the new Province is now being prepared by an official of the Sind Engineering Service. It is hoped that by the co-ordination of existing supply companies even small villages will be supplied with electricity. It is understood that the scheme will be ready within a month for the consideration of Government.

King's Lynn.—STREET LIGHTING.—Improved lighting is to be installed in London Road, and £3,000 is to be spent on lighting side streets.

CHANGE-OVER.—D.c. supplies in the Avenue road district are to be changed over to a.c. at a cost of £6,460.

Leeds.—AERODROME EQUIPMENT.—The Corporation is applying for sanction to a loan of £14,500 for equipping the aerodrome at Yeadon with apparatus for blind landings.

NEW EQUIPMENT.—Sanction to borrow £124,900 for the provision of a switchhouse, switchgear and transformers at Whitehall Road power station is being sought by the Electricity Committee.

Leicester.—ASSISTED WIRING.—The Electricity Committee has decided to extend the assisted-wiring scheme to fires and cookers.

Leyland.—BETTER LIGHTING.—A scheme for improved lighting is under discussion by the Council. Plans will be considered for a new lighting schedule, giving the comparative cost of electricity and gas.

Lincoln.—STREET LIGHTING CONTROL.—Experiments are to be carried out with a new type of control unit for extinguishing street lamps.

EXTENSIONS.—It is proposed to extend the mains to the Monks Tower Estate at a cost of £2,990.

Liverpool.—SUPPLY FOR BATHS.—The Electric Power and Lighting Committee is to supply electricity for heating purposes at the Stanley Park open air baths. The cost will be £582.

London.—HAMMERSMITH.—The Education Committee is to install electricity in the Old Oak school.

LEWISHAM.—The Works Committee is to light Whitefoot Lane, Catford, with 250-W electric-discharge lamps at an annual cost of £571, and improve the lighting of Southend Lane at an annual cost of £560.

ISLINGTON'S FLOODLIGHTED PEDESTRIAN CROSSING.—An interesting installation has been carried out by the Borough Council at the suggestion of Mr. W. H. Gimson, the borough engineer, at the junction of Copenhagen Street and Cloudesley Road, where there are two pedestrian crossings. The lighting units employed consist of single piece steel columns 13 ft. 6 in. to the light centre, designed in conformity with the illuminated guard posts. Mounted at the top are specially designed 100-W sodium floodlanterns with a clean line of cut-off giving a complete absence of glare up and down the road. The lanterns are developed by Rowland's Electrical Accessories, Ltd., in conjunction with Gowshalls, Ltd., manufacturers of the bollards and traffic islands.

A view of the new Town Hall at Chesterfield sent to us by Mr. D. H. Davies, general manager and engineer of the Electricity Department. The floodlighting is by means of twenty-three basement-mounted projectors with 1,000-W lamps

SOUTHWARK.—The electricity Committee is to carry out free wiring at an estimated cost of £864. Sanction to a loan of £10,000 for electrical apparatus on hire is being sought.

Loose (Kent).—NO STREET LIGHTING.—Although twenty-three electors voted for and only nine against the adoption of the Street Lighting Act at a parish meeting they did not represent two-thirds of those present, and it was decided to take no action. The provision of five lamps in the village would cost a penny rate.

Morecambe and Heysham.—SUB-STATION.—The Town Council is to build a sub-station in the Figure Eight Park area at a cost of £3,550.

Murton (Co. Durham).—ELECTRICITY FOR TWO HUNDRED HOUSES.—The North-Eastern Housing Association is to install electricity in 224 houses.

New Zealand.—HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical Engineer & Merchandiser*, it has been announced by the Minister of Works that the Cabinet is considering an extension of the Waikaremoana hydro-electric scheme at a cost of £1,000,000. The power station is situated at the outlet from Lake Waikaremoana which is near the east coast of the North Island.

Newark.—LIGHTING.—The borough surveyor is to prepare a scheme for lighting the London Road car park by electricity.

Northolt.—SUB-STATION.—The Uxbridge & District Electric Supply Co., Ltd., is to erect a sub-station in Western Avenue.

Penarth.—FRINGE ORDER REVOKED.—The Electricity Commissioners have decided to revoke the Fringe Orders by which Sully was supplied by the Penarth electricity undertaking from June 1st next, the Council taking its supply after that date from the Cardiff Rural District Council.

Peterborough.—CHANGE-OVER.—A change to a.c. is to be made in Cobden Avenue, Craig Street and Broadway, between the Theatre and Fitzwilliam Street, at a cost of £1,147.

Romford.—REMOTE-CONTROLLED STREET LIGHTING.—A new system of remote control for the instantaneous switching off of public lighting in cases of emergency was inaugurated last Wednesday when a new street lighting installation provided by the Borough Council in conjunction with the County of London Electric Supply Co., Ltd., was switched on in Eastern Avenue. Eighty-seven B.T.H. "Mercra H" horizontally operating lanterns housing mercury e.d. lamps and fitted with a magnetic device for improving the diffusion have been utilised, the units being situated centrally in the grass verges between the dual carriageways at a distance of 300 ft. apart and staggered on the outside of each carriageway. This gives an alternate arrangement of lanterns on each roadway at a linear distance of 150 ft. apart. The layout is modified somewhat at roundabouts and important road intersections.

Rotherham.—POWER STATION IMPROVEMENTS.—The Electricity Committee recommends the Council to spend between £100,000 and £120,000 on improvements to the power station.

Seaton Valley (Northumberland).—ELECTRICITY IN COUNCIL HOUSES.—Electricity is to be installed by the Urban District Council in 176 houses on the Backworth Station Estate. Plans are by the Surveyor, Council Offices, Shiremoor.

Sheffield.—EXTENSIONS.—The Electricity Committee has approved extensions to street mains costing £19,231.

Shipley.—APPARATUS FOR HIRE.—Storage heaters, breakfast cookers and automatic oven controls are to be let out on simple hire at the following charges per quarter:—"Ritemp" automatic oven control (including simmering device), 1s.; breakfast cooker, 2s. 6d.; 1½-gal. "Santon" storage water heater, 3s.; 3-gal., 3s. 6d.; 5-gal., 4s.; 12-gal., 5s.

Shipston-on-Stour.—ELECTRICITY CHARGES.—Following its inquiry last July into the charges for electricity made by the Shropshire, Worcestershire and Staffordshire Electric Power Co. for rural areas, the Ministry of Transport states that it does not feel justified in making an order for a reduction in the charges.

South Shields.—SUB-STATIONS.—The erection of sub-stations in the Roman Remains Park, Brunswick Place and at Tyne Dock is proposed by the Town Council.

Southall.—ELECTRICITY IN COUNCIL HOUSES.—About 350 Council houses are not wired for electricity and 170 do not possess the means of obtaining a satisfactory hot-water supply. The Housing Committee is of the opinion that all Council

houses should have electricity and hot-water services installed, and is to prepare a detailed report on the matter.

Spain.—ELECTRICITY IN CATALONIA.—The Barcelona Correspondent of *The Times* reports that the Prime Minister has dissolved the organisation named Unified Electrical Services of Catalonia. This is the first step towards abolishing control by the Workers' Committee and restoring the concern to private ownership. This should prove welcome news for the Ebro Electric Light & Power Co., in which large sums of British capital have been sunk.

Stoke-on-Trent.—LOANS.—The Electricity Committee has obtained sanction to borrow £150,000 for mains and services and £50,000 for cookers, and is seeking permission to borrow £24,000 for general change-overs and £20,000 for sub-station extensions.

OVERHEAD LINES.—Consent to the erection of an overhead line at Packmoor, Bemersley, has been obtained by the Electricity Committee.

SUPPLY EXTENSION.—At a recent meeting of the Electricity Committee the engineer submitted correspondence from Josiah Wedgwood, Ltd., Barlaston, with regard to an electricity supply to the new works now being erected by them. It was agreed to afford the supply at the tariffs already approved for enamelling and glost kilns. A Fringe Order will be required.

Surrey.—ASSESSMENT APPEAL.—The Surrey County Council has authorised a contribution towards the cost of the North-Western Area Assessment Committee in connection with an appeal by way of a special case to the Divisional Court. The appeal arises out of a question as to whether the ring trunk main of the Metropolitan Electricity Supply Co., Ltd., ought to be treated as partly directly productive (that is to say, in the parishes in which it is tapped to give a supply to authorised distributors) and partly indirectly productive (that is to say, in the parishes where it is not tapped), and whether as regards indirectly productive parts a percentage ought to be taken on the structural value and the residue apportioned between the parishes in which there are directly productive parts of the undertaking in accordance with the gross receipts of the parish.

Torquay—SUPPLY TO BROADCASTING STATION.—Arrangements have been made by the Electricity Committee for various works including overhead lines, switchgear, etc., to provide a supply of electricity to the B.B.C. station at Start Point at a cost of £12,150. The transmission lines will be erected so that a supply will be afforded to the parish of South Pool and the Portlemouth district.

SUPPLY EXTENSION.—The Electricity Committee is to provide a supply to Little Dartmouth Farm, within the area of supply of the Dartmouth and Kingswear Electricity Supply, and is to discuss with Major R. Rayner, M.P., the question of supplying the parishes of Manaton and Widecombe-in-the-Moor.

Uttoxeter.—BETTER LIGHTING.—The Electricity Department is to have a high voltage main laid at a cost of £2,000, and a £500 scheme for improving the lighting of the town is to proceed immediately.

Wakefield.—SUB-STATION EQUIPMENT.—The Electricity Committee has obtained sanction to borrow £8,000 for sub-stations and equipment.

Wallasey.—ILLUMINATIONS AT NEW BRIGHTON.—In conjunction with the borough engineer and electrical engineer a sub-committee is preparing a scheme of autumnal illuminations to include coloured floodlighting of the promenade.

LOANS.—The Electricity Committee has obtained sanction to borrow £1,552 for fire protection apparatus, £6,899 for mains, £857 for sub-station equipment, and £819 for sub-stations.

Wallsend-on-Tyne.—CABLES.—Approval has been given to plans by the North-Eastern Electric Supply Co., Ltd., for low-voltage cables underground in High Street and Coronation Street.

Walsall.—BETTER LIGHTING.—The Highways Committee has approved a modified scheme costing £5,380 for improving the public lighting on main traffic routes.

West Hartlepool.—NEW CABLE.—The Town Council is to spend £1,509 on laying a cable to a new aerodrome.

Whitby.—BALLOT AT GOATHLAND.—Householders in the village of Goathland are to ballot on a scheme by the North-Eastern Electric Supply Co., Ltd., for supplying the village with electricity.

Wolverhampton.—SUB-STATION.—The Electricity Committee recommends a contribution of £21,750 to the West Midlands Joint Electricity Authority towards the cost of providing a grid sub-station at Bushbury for the purpose of meeting the growth of load and as an air raid precaution.

SUB-STATION.—An additional sub-station is to be erected in Silver Birch Road at an estimated cost of £2,520.

Worthing.—MAINS AND SERVICES.—The Electricity Committee is seeking sanction to borrow £50,000 for mains and services.

York.—LIGHTING.—The Corporation is to light the whole of Carr Lane, Acomb, by electricity.

ELECTRIC HEATING FOR MUNICIPAL OFFICES.—The Castle Committee has considered a report of the consulting engineers on alternative methods of heating the new municipal offices, and recommends heating by electricity, by means of an electrode boiler and thermal storage system. The distribution of heat is to be on the panel system.

Traction

Blackburn.—JOINT TRANSPORT PROPOSAL.—It is reported that a joint meeting between Blackburn, Darwen and Accrington Committees to discuss the question of a joint transport board for the area is expected to be held shortly. If the meeting should be successful the joint committee would appoint a manager to control the three undertakings.

Dudley.—TROLLEY-BUSES.—The Town Council has approved a recommendation to continue until 1956 an agreement under which the Corporation operates a trolley-bus service between Dudley and Wolverhampton.

Leeds.—ELECTRICAL EQUIPMENT FOR DEPOT.—All the mechanical equipment at the L.N.E.R. depot at Wellington Street is being replaced by electrically operated plant, including eleven electric capstans, five electric warehouse hoists, one 2½-ton fixed electric jib crane and one 6-ton mobile petrol-electric crane.

London.—MORE TROLLEY-BUSES.—Further conversions from tramway to trolley-bus working took place last week-end when the scheme passed its half-way mark. Three North London routes were inaugurated, the total distance being 74 miles. For the scheme 60 miles of wire and 1,400 poles were used, 90 new vehicles being used, bringing the fleet's total to 812. The change-over includes one new and two converted routes—No. 625 for Walthamstow to Wood Green tube station, with an extension to Woodford; No. 629 to replace tram route No. 29 from Enfield Town to Tottenham Court Road; and No. 641 from Winchmore Hill to Moorgate, to replace tram route No. 41. Londoners now make 400,000,000 journeys a year in trolley-buses, 60,000,000 journeys being made at workmen's fares.

Oldbury.—ACQUISITION OF TRAMWAY UNDERTAKING.—The Town Council has decided to give notice to the Birmingham and District Investment Trust, Ltd., requiring the company to sell to the Corporation, on December 31st next, so much of its tramway undertaking as is within the borough of Oldbury.

Russia.—MOSCOW UNDERGROUND RAILWAY.—The first trial journey has taken place on the Gorkovsky line of the Moscow underground railway, reports *Reuters Trade Service* from Moscow. Starting from the Sokol station near the depôt, the first train travelled the whole length of the line (9.7 km.), stopping at each of the six stations, Sokol, Aeroport, Dynamo, White-Russian Station, Mayakovsky Square and Sverdlov Square, and then making the return journey. The stations on the Gorkovsky line are faced with marble, decorated with bas-reliefs and mosaics and lighted by a large number of electric lamps. Escalators convey the passengers straight from the halls to the platforms.

Southern Railway.—ELECTRIFICATION EXTENSION.—The first experimental electric train ran on the Horsham-Portsmouth line between Three Bridges and Amberley on Sunday. The journey to Horsham, including three stops, took 17 minutes each way, and later tests were made of the sidings and points, including a run to Warnham. Afterwards the train ran from Horsham to Amberley, calling at Christ's Hospital, Billingshurst and Pulborough. In connection with the electrification to Horsham, 480 trains conveying material have been run, and 66 cable trains, carrying 490 drums of cable. About 270 miles of cable have been laid.

United States—FURTHER ELECTRIFICATION.—An electric service was inaugurated by the Pennsylvania Railroad on April 15th on its through east and west freight routes between the New York and Philadelphia districts and Harrisburg, as well as between Harrisburg and Perryville, where the newly electrified rails join with those previously electrified to Baltimore and Washington. Conversion of this additional heavily used section to electric traction has been proceeding since early in 1937, when it was initiated in connection with the work of extending electrification of the main line westward from Paoli to Harrisburg. This latter phase of the project was completed on January 15th, with the opening of electric passenger service between Philadelphia and Harrisburg. The railway is now completely electrified on the principal lines in the whole eastern seaboard territory, embracing the area between New York in the north and Washington in the south, and from Philadelphia on the east to Harrisburg on the west.

Radio Relays

At the recent annual conference of the National Chamber of Trade the following resolution tabled in the name of the Relay Services Association of Great Britain was unanimously adopted: "This Chamber reaffirms its opposition to nationalisation of private enterprise, and appeals to the Postmaster-General to clarify without delay the future of the Relay industry." Mr. J. W. C. Robinson and Mr. E. A. Wyatt were the Relay Association delegates. The Assistant Postmaster-General, speaking for Major Tryon, said that the Post Office had not asked for the scheme, but that it had been thrust upon them.

Uni-Relays, Ltd., has taken over the whole of the relay services in the Accrington area, and has now applied for consent to operate in Clayton-le-Moors.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Abertillery.—May 16th. Electricity Department. Materials for twelve months. (April 29th.)

Argentina.—BUENOS AIRES.—June 7th. Navigation and Ports Department. 287,500 metres of welding electrodes. (T.Y. 21507/38.)*

Australia.—MELBOURNE.—May 16th. City Council. Metal-clad switchgear for city sub-stations. (T.Y. 20797/38.)*
June 15th. Victorian Railway Commissioners. 250-V copper conductors. (T. 21258/38.)*

Beckenham.—May 23rd. Electricity Undertaking. Conduit and conduit fittings for the period ending March 31st, 1939. (See this issue.)

Belfast.—May 20th. Electricity Department. Loud speaking telephone equipment for Harbour power station. (May 6th.)

Birmingham.—June 15th. General Purposes Committee. Complete electrical installation in a block of municipal offices now in course of erection. (April 29th.)
May 18th. Electric Supply Department. Cable jointing compound for twelve months. (May 6th.)
May 30th. House service meters for six months. (See this issue.)
May 23rd. Public Assistance Committee. Electric lighting and power, electric bed lift, fire alarms and bells and heating installations for Highbury Home, Moseley. (May 6th.)

Bingley.—May 31st. Electricity Department. Two 500-kW mercury-arc traction rectifiers with transformers, switchgear, &c. (May 6th.)

Bradford.—May 18th. Corporation. Fire extinguishing installations for five 33-kV switch houses. (May 6th.)

Burnley.—May 16th. Electricity Department. Four 750-kVA transformers. (April 29th.)

Cardiff.—May 25th. R.D.C. One multi-stage centrifugal pump and electric motor. Clerk of the Council, Park House, 20, Park Place (deposit £2 2s.).

Cheadle and Gatley.—May 16th. Electricity Department. One 250-kVA transformer. (April 29th.)

Cleethorpes.—June 11th. Electricity Department. H.v. switchgear and two 250-kVA transformers. (See this issue.)

Croydon.—May 17th. Electricity Department. Stores and materials for twelve months. (April 29th.)

Dagenham.—May 20th. U.D.C. Electrical installations in 160 houses on the Mill Park housing estate, Chadwell Heath. (May 6th.)

Dumfries.—June 3rd. Electricity Department. L.v. underground cables for twelve months. (See this issue.)

Dundee.—May 16th. Housing Committee. Electric lighting of cottages at Magdalene's Kirkton. Town Clerk.

Ealing.—May 30th. Electricity Department. Jointing materials, pavement frames and covers and general stores for twelve months. (See this issue.)

East Ham.—May 21st. Electricity Department. Electricity meters. (See this issue.)

Edinburgh.—May 20th. Corporation. Electric lighting installation for Holy Cross Academy. Town Clerk.

Egypt.—CAIRO.—June 7th. Ministry of Public Works. Three 65-kW, Diesel d.c. generating units. (T.Y. 21605/38.)*

Epsom.—May 16th. Electricity Department. P.i., lead-covered and double steel armoured l.v. cable. (April 29th.)

Exeter.—June 6th. Electricity Department. Cable and one 6,000-kVA transformer. (See this issue.)

Hastings.—May 30th. Electricity Department. Boiler fuel for mechanical stokers at Broomgrove sub-station. (May 6th.)

Hoylake.—May 31st. Water Department. One 100-kW Diesel engine generator. Clerk of the Council.

Hull.—Telephone Committee. Telephone cables. (See this issue.)

India.—SIMLA.—May 19th. Indian Stores Department. Five-core flexible cable for inter-vehicle electric couplers. (T. 21267/38.)*

Inverness.—May 27th. County Council. Electrical installation in new school buildings at Huntly Street. J. W. McKillop, County Clerk, County Buildings.

Kirkcudbright.—May 17th. County Council. Electrical work at new police houses. County Clerk.

Lancashire.—May 20th. County Council. Electric lighting installation at the new senior Council school at Maghull, nr. Ormskirk. Clerk of the County Council, County Offices, Preston (deposit £2).

Leigh (LANCS).—May 16th. Transport Department. One 10,000-gal. storage tank complete with electric pump and motor, piping and gravity feed meter, and one electrically driven band saw, compelte with motor. Town Clerk, Town Hall.

Liverpool.—June 1st. Electric Supply Department. Two 50-Ah, 230-V control batteries. One 22,000-V, 500,000-kVA switchboard and one 10,000-kVA, one 4,000-kVA, and four 8,000-kVA transformers. Extensions to existing switchboards embodying circuit-breakers. (See this issue.)

Middlesex.—June 3rd. County Council. Electrical installation at the West Middlesex County Hospital extension, Isleworth. (April 29th.)

Newcastle-on-Tyne.—City Council. Electrical installation at the Whickham View senior schools. T. Walling, director of education.

Newcastle-under-Lyme.—May 20th. Electricity Department. One 500-kVA and one 250-kVA three-phase transformers. (See this issue.)

New Zealand.—WELLINGTON.—June 9th. Posts and Telegraph Department. 6,600 ft. of telephone cable. (T.Y. 20903/38.)*
May 31st. One d.c. motor generator set complete with accessories and spares. (T.Y. 20758/38.)*
July 26th. Public Works Department. Nine oil circuit breakers complete with accessories for Section 453 of the Mangahao scheme. (T. 21120/38.)*
August 9th. One complete set of 110-kW steelwork, switchgear and accessories for use at the Waitaki sub-station. (T. 21119/38.)*
AUCKLAND.—May 23rd. Electric Power Board. 42,000 l.v. porcelain insulators. (T. 20907/38.)*

Nottingham.—May 16th. Installation of electricity supply from mains to Hopwell Hall special school. County architect, County Hall (deposit £1 1s.).

Nuneaton.—June 4th. Electricity Department. One mercury arc rectifier kiosk. (See this issue.)

Perth.—May 14th. Corporation. Electric lighting of 214 houses at Muirton. Town Clerk (deposit £1).

Peterborough.—May 30th. County Council. Electric lighting, power and bell installations in new Public Assistance Institution block. W. J. Deacon, Clerk of the County Council, Bridge Street (deposit £2 2s.).

Portsmouth.—May 20th. City Council. Switchgear and wiring of plant at the Victoria Park Baths. (May 6th.)

Risca (Mon).—May 17th. Electricity Department. Stores and materials for the period ending March 31st, 1939, and sub-station electrical equipment. (May 6th.)

Sleaford.—May 23rd. Joint Visiting Committee. Electrical installations at Rauceby Mental Hospital. (May 6th.)

Slough.—May 13th. U.D.C. One electrically driven low-lift borehole pump. A. Bromly, water engineer, Town Hall.

South Africa.—JOHANNESBURG.—May 21st. City Council. Twenty-two h.v. circuit-breakers complete with accessories. (T.Y. 20940/38.)*
June 18th. Four portable voltmeters and four portable ammeters. (T. 21566/38.)*
May 30th. Electricity Supply Commission. One 15,000-kVA interconnector transformer. (T. 21731/38.)*

Spalding.—May 23rd. R.D.C. One electrically driven booster pump complete with motor and time switch. Council Offices (deposit £3).

Tunbridge Wells.—May 30th. Corporation. Electrical installation at the new police court and station. (See this issue.)

Wallasey.—May 17th. Borough Council. H.v. and l.v., p.i. cables. (May 6th.)

Walton and Weybridge.—May 18th. Electricity Department. One e.h.v. 11,000-V feeder cable and two 300-kVA three-phase transformers. (April 29th.)

West Ham.—June 17th. Electricity Department. One 200-kW electric generator and one five-panel switchboard. (April 29th.)

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Banff.—Works Committee. Accepted. Electric lighting installations: New school at Keith.—A. Grant. Portsay police station and chief constable's house, Banff.—H. Watson. Aberchirder police station.—J. S. Milne.

Barrow-in-Furness.—Electricity Committee. Accepted. Switchgear for pumping station (£1,258).—Ferguson, Pailin. Switchgear for sub-stations (£591).—B.T.H. Switchgear and kiosks for rural area (£2,318), switch panel (£227), and meter-testing equipment (£1,011).—Met.-Vick. Elecl. Co. Internal telephones (£176).—Standard Telephones & Cables.

Bristol.—Hospital Committee. Recommended. Re-wiring Ham Hospital (£1,335).—Colston Electrical Co.

Durham.—County Council. Accepted. Electrical installation at the new agricultural school at Houghall (£1,148).—F. Reid, Ferens & Co. Electricity supply to the Manor Farm, Hart (£190).—North-Eastern Electric Supply Co.
Agricultural Committee. Accepted. Electrical installation at school of agriculture (£1,148).—F. Reid, Ferens & Co.

Eccles.—Finance Committee. Accepted. Electrical installation at bus station (£183).—S. Watkins.
Electricity Committee. Accepted. Distribution boards (£263).—English Electric Co. Switchboard for Monton sub-station (£811).—Met.-Vick. Elecl. Co. Meter-testing equipment (£1,380).—Landis & Gyr.

Glasgow.—Electrical installation at the new Beresford hotel.—W. C. Martin & Co.

Ilford.—Electricity Committee. Accepted. Switchgear: Grove Road (£5,081) and Uphall Road (£7,315).—Crompton Parkinson. Testing equipment: One three-phase a.c. (£769), four single-phase a.c. (£511), and six d.c. (£373).—British Sangamo Co. One d.c. battery control panel (£220).—Bertram Thomas.

Leeds.—Assistance Committee. Accepted. Electric lighting work at Institution lodge (£170).—F. H. Snowden.

Liverpool.—Electric Power and Lighting Committee. Accepted. Replating the battery control at Lister Drive power station (£770).—Chloride Electrical Storage Co.

London.—L.C.C.—Education Committee. Accepted. Electrical installations in schools: Childeric Road, Deptford (£1,111) and Grafton Road, Islington (£841).—F. Troy & Co. Finsbury Park Senior, Islington (£1,072).—G. Hopkins & Son. Gipsy Road, Norwood (£1,247).—F. H. Wheeler & Co. Huntingfield, Putney (£863) and Poole's Park, Islington (£1,081).—Pemberton & Sturgess. Kingwood Road, Fulham (£1,289) and Stillness Road, Lewisham (£1,307).—Holliday & Son (Electrical). Lollard Street, Lambeth (£1,438) and Rathfern Road, Lewisham (£1,005).—Warren Smith & Co. Newington Green, Islington (£1,744).—A. Cozens. Paragon, Southwark (£1,839).—Carr Brothers. Sigdon Road, Hackney (£1,464).—A. Meckhonik. Woolwich Day Continuation (£865).—Barlow Brothers & Co. City Literary Institute, Holborn (£2,256).—F. H. Wheeler & Co. St. Martin's School of Art and the L.C.C. Technical Institute, Westminster (£3,999) and electric wiring and fittings in the new hostel and gymnasium at Furzedown Training College, Streatham (£2,077).—Berkeley Electrical Engineering Co.

Northumberland.—County Council. Accepted. Electric lighting installation at the Newbiggin infant welfare centre.—F. R. Little.

South Shields.—Town Council. Accepted. Repairs to battery at the electricity works (£478).—Tudor Accumulator Co.

West Bridgeford (NOTTINGHAM).—Notts Education Committee. Accepted. Electrical installation at new secondary school (£202).—F. Lamb.

Weymouth.—Electricity Committee. Accepted. Transformer conversions (£1,881).—English Electric Co.

Accepted. P.i., l.c., s.t.a., 650-V cables (£4,303), and p.i., l.c., s.t.a., 11-kV cable (£418).—Ismay Cables.

Forthcoming Events

Institution of Electrical Engineers (*Transmission Section*).—Friday, May 13th, to Tuesday, May 17th. Week-end visit to Belgium.

Meter and Instrument Section.—Friday, May 20th. Institution, London, W.C.2. 7 p.m. "Electrical Temperature Measurements in Physiology." Prof. A. V. Hill.

Irish Centre.—Thursday, May 19th. Trinity College, Dublin. 6 p.m. Annual general meeting.

Association of Mining Electrical Engineers (*South Wales Branch*).—Tuesday, May 17th. 110/112, Queen Street, Cardiff. Annual meeting.

Association of Supervising Electrical Engineers.—Tuesday, May 17th. Electricity Showrooms, Ferensway, Hull. 7.15 p.m. "Compulsory Wiring Regulations and Registration." Mr. Alan Kirk.

Royal Society.—Wednesday, May 18th. Burlington House, London, W.1. 8.30 p.m. Conversazoine.

Batti-Wallahs' Society.—Wednesday, May 18th. Hotel Victoria, London, W.C.2. 12.30 for 12.55 p.m. Luncheon to J. Ellis Barker.

Institute of Transport.—Wednesday, May 18th, to Saturday, May 21st. Edinburgh. Annual Congress.

Incorporated Municipal Electrical Association.—Monday, May 23rd, to Saturday, May 28th. Torquay. Annual Convention.

Notes

The E.I.B.A.

The Electrical Industries Benevolent Association has received £742 from the Radio Manufacturers' Association, being the major portion of the nucleus of a fund which was collected at a time when the latter body was considering the inauguration of a benevolent fund for the radio trade as a whole. Later the R.M.A. appreciated the considerable difficulties of running a fund satisfactorily and commendably realised the benefits of assisting towards co-ordination. The E.I.B.A. has been dealing with a large number of radio cases, and this addition to its funds, which is specifically earmarked, in accordance with the Charity Commissioner's requirements, for relieving persons belonging to, or connected with, the radio industry, will be a considerable help in meeting its rapidly increasing total of grants and allowances which is at the moment doubling itself every two years.

A Bell Film

The Western Electric Co., Ltd., states that the 20th Century Fox concern is to produce a film centreing around the life of Alexander Graham Bell, the inventor of the telephone. The first electrical transmission of speech was accomplished by Bell in 1875.

Specification for Contactors

Contactors when supplied separately or in combination with other gear for use as circuit-breakers, motor starters, etc., in air or oil, and operated electro-magnetically, electro-pneumatically or mechanically, form the basis of B.S.S. No. 775-1938, which has just been published. Full details are given as to carrying, making and breaking capacities for all classes of duty, with the exception of that for welding equipment, where the operating conditions are too varied to permit of standardisation. As a guide to users of electric welding equipment, however, information that should be given with inquiries, according to the duty of the welding equipment, is included in the specification. Further details are specified with regard to general construction, with particular reference to temperature limits, range of operation and silence of contactors used on a.c. systems, the methods that should be employed to reduce noise and hum during construction and operation, together with the type of enclosure, being adequately dealt with. Copies of this new specification may be had from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. each (2s. 2d. post free).

Czechoslovak Convention

To celebrate its twentieth anniversary the Elektrotechnicky svaz Ceskoslovensky (Electrotechnical Association) is holding its annual convention at Prague from May 28th to 31st. The programme, containing general information in French, indicates that the principal events will be an exhibition to illustrate the progress made in various branches of the electrical industry in Czechoslovakia; technical lectures in seven sections; discussion and adoption of supplements to, and revisions of, the Czechoslovak Electrical Safety Code; and visits to places of technical interest with social events and a special programme for ladies. Further information is obtainable from the Association at Vocelova 3, Praha, Czechoslovakia.

A.S.E.E. Annual Meeting

On May 2nd the Association of Supervising Electrical Engineers held its annual general meeting at the National Hotel, London, W.C.1, when there was a large attendance of members. The chairman of the association, Mr. H. A. Crabtree, B.Sc.(Tech.), presided and in his opening address he referred to the enormous amount of work which had been done by the Association in the past twelve months, particularly on the educational side. The annual report of the Executive Council showed the wide field covered by the work of the Association. Benefit schemes, educational activities and competitions, provincial organisation, salaries, and employment conditions, compulsory wiring regulations and registration, and electricity distribution were a few of the subjects dealt with. In a resolution, carried unanimously, the meeting conveyed its congratulations to the organisations represented on the new committee formed to deal with compulsory wiring regulations and registration on their interest in the question, and extended its best wishes for a successful conclusion to the labours of that committee in the interests of the electrical industry and the public. Another unanimous resolution was one welcoming the efforts being made to organise the distribution side of the electricity supply industry on an efficient basis, and expressing the belief that only by some means of unification could the benefits of this national asset be secured for the public. It also called upon the Minister of Transport to take such steps in the promised Bill as he might deem necessary to achieve the greatest good for the greatest number; and that any Bill introduced should contain provisions safeguarding the consumer against unskilled installers and inferior and dangerous installations. The voting for five vacancies on the Executive Council resulted in Messrs. C. W. Bullock, J. Munro, F. G. Quance, F. W. Smith and J. J. Smith being elected, and a vote of thanks was passed to Messrs. T. H. Clark, J. Southern and T. Whetton in appreciation of their services on that body during the past three years. The Executive Council will hold its first meeting of the new Session on May 16th, when the officers and committees for the year 1938-1939 will be elected.

Materials and their Testing

The Joint Committee on Materials and their Testing now has a membership of twenty-five co-operating institutions and societies. The annual report announces that a general discussion is being arranged to focus on a group of papers on various aspects of non-destructive testing, including the use of X-rays and gamma rays and magnetic, electrical, acoustic and general methods, with the object of presenting and recording the general state of knowledge and current opinions. Steps have accordingly been taken to secure papers from Germany, Holland and the United States, as well as from this country. The discussion will take place in November next under the ægis of the Institution of Electrical Engineers. By arrangement, the Joint Committee has taken over the duties of the British Committee of the International Association for Testing Materials, and communications should be addressed to its secretary, care of the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, London, S.W.1.

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

STONIFLEX cable.
MAGNUM irons.
COMITE insulating material.

Readers should enclose stamped addressed envelopes when making their enquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

The Hon. J. R. Rea was appointed secretary of the British Electrical and Allied Manufacturers' Association (Inc.) at the recent meeting of the Council, taking over this office from **Mr. C. Rodgers,** who has occupied the dual positions of deputy director and secretary since 1935. This change has been necessitated by the increasing demands on the time of Mr. Rodgers in connection with his duties as deputy director, which position he still retains. Mr. Rea, the second son of Lord Rea of Eskdale, was born in 1902 and educated at Westminster School during the headmastership of Dr. J. J. Gow. He took his degree in economics and history at Christ's College, Cambridge, in 1923, and was called to the Bar by the Middle Temple in 1926. At the Bar he specialised in the Common Law side, under the aegis of such leaders as Stuart Bevan, K.C., P. E. Sandlands, K.C., and R. Storry Deans. He was later appointed to the Treasury Solicitors' Department at Westminster and was engaged in matters concerning the Admiralty, War Office and Air Ministry. In March, 1936, he joined the B.E.A.M.A. as assistant on the legal side to Mr. O. A. Weekes, who retired last March.

The Hon. J. R. Rea

Mr. H. A. Crabtree, chairman of the Association of Supervising Electrical Engineers, was presented with a gold medallion at the annual meeting of the Association on May 2nd to commemorate his year of office as chairman. The presentation was made by Mr. J. Southern, the immediate past chairman.

Mr. H. S. Ellis, M.I.E.E., general manager and chief engineer of the West Gloucestershire Power Co., Ltd., has been nominated for the chairmanship of the Western Centre of the Institution of Electrical Engineers for the session 1938-39.

In an interval during the second round of Henley's head office spelling bee on May 3rd **Mr. W. F. Bishop** was presented with an illuminated address reading: "With a sense of appreciation of the consistent and valued support Mr. W. F. Bishop has given to the Henletel Social and Athletic Club since its formation in 1919, and on behalf of its members, we wish him God speed on his journey to South Africa on May 6th and couple with it good wishes for the successful outcome of his activities in the Union." The address was signed by members of the Social Club executive and presented by Mr. W. A. Moore, Social Club chairman.

Mr. J. H. Sumner, whose article on "Economic Cable Sections" appears on page 679, is leaving this country at the end of the present month to take up the position of assistant engineer under the Government of the Federated Malay States. After four years at the Manchester College of Technology Mr. Sumner joined the Yorkshire Electric Power Co. in 1931, and subsequently took up an appointment with the Mid-Cumberland Electricity Co., Ltd., a position which he is now vacating.

Mr. J. H. Sumner

Major T. Russell Cairns has been elected president of the North-East Coast Institution of Engineers and Shipbuilders for the 1938-39 session.

Mr. G. S. Szlumper, C.B.E., has been elected president of the Institute of Transport for the year commencing October 1st, 1938. Mr. Szlumper, who is a foundation member of the Institute, served as a member of the Council from 1924 to 1927 and 1929 to 1932, and from 1932 to 1935 as a vice-president.

Mr. J. Dodds is now representing M. & C. Switchgear, Ltd., in Northumberland and Durham, Yorkshire, Lancashire and North Wales, and is at the branch office of the associated company, Mavor & Coulson, Ltd., Castle Chambers, Castle Street, Sheffield, 3 (telephone: Sheffield 25178). His private address is 70, Carter Knowle Road, Millhouses, Sheffield (telephone: Sheffield 51780).

Mr. J. W. Scollay, who has been appointed electrical engineer and manager to the Lerwick Town Council, has had nearly nineteen years' experience in electrical and mechanical engineering. He was a student of Glasgow Technical College. For a time he was with the Greenock Corporation Electricity Department, and for the past nine years has been assistant electricity engineer with the Burma Corporation.

Mr. J. E. Edgley, who is retiring after thirty-five years' service with the County of London Electric Supply Co., Ltd., has been presented by the staff and the employés at New London Road, Chelmsford, with a Westminster chiming clock, together with a filigree brooch for Mrs. Edgley. The presentation was made by Mr. R. T. Harper, the company's local manager.

Mr. P. J. Whiting, of Taylor, Whiting and Taylor, was elected chairman of the Derby branch of the Electrical Contractors' Association at its annual meeting, held on May 3rd.

The University Court of Glasgow on May 5th appointed **Mr. J. Small,** D.Sc., Ph.D., M.I.Mech.E., M.I.E.S., to the James Watt Chair of the Theory and Practice of Heat Engines, in which department of the University he is at present lecturer.

Mr. P. F. Bennett, chairman of Joseph Lucas, Ltd., and president of the Federation of British Industries, and **Sir John Anderson,** late Governor of Bengal, have joined the board of Imperial Chemical Industries, Ltd.

Mr. A. W. Saulter, for nine years sales manager of the Croydon Cable Works, Ltd., has been appointed general manager of Clough (Croydon), Ltd., manufacturers of general engineering supplies and specialities.

Mr. C. A. Stephens, overseas manager of A. Reyrolle & Co., Ltd., has been appointed to the board of directors of the Parolle Electrical Plant Co., Ltd.

Mr. J. E. Woollaston has been elected chairman of the South Midland Students' Section of the Institution of Electrical Engineers for the 1938-39 session.

Mr. N. Brooksbank, chief London engineer of the Victoria Falls and Transvaal Power Co., Ltd., who has been on a visit to Johannesburg and the Victoria Falls, Rhodesia, arrived in England on May 6th by the *Stirling Castle*.

The Norwich City Council has now confirmed the appointment of **Mr. R. W. Steel,** A.M.I.E.E., as deputy city electrical engineer of Norwich. Mr. Steel went to Norwich as technical assistant in 1932, and was promoted to chief technical assistant in 1936. He has held previous appointments in the electricity supply industry with the Newcastle and District Electric Lighting Co., and the Stoke-on-Trent Electricity Department. Before entering the electricity supply industry he was in the editorial offices of the *Wireless Press*, later serving three years with the Marconi International Marine Communication Co. as a wireless operator. He afterwards became a pupil at the Wolverhampton works of the Electric Construction Co., and subsequently obtained an appointment with the British Gas Light Co. at Stoke-on-Trent. Mr. Steel was joint author, with Mr. V. Alex. Pask, of a paper on "The Development of Electricity Supply in a Rural Area," read before the I.M.E.A. Convention at Brighton last year. He is at present chairman of the Norwich and District E.D.A. Circle.

Obituary

Mr. W. E. Highfield.—It is with deep regret that we have to record the death of Mr. William Eden Highfield, M.I.E.E., who passed away peacefully in the home of his brother, Mr. J. S. Highfield, at Cookham Dean, on May 7th. He was a partner in the firm of Highfield and Roger Smith, consulting engineers, and but for his long illness and death would have been nominated by the Council of the Institution of Electrical Engineers as president for the coming session. He was chief designer of d.c. machinery with Dick, Kerr & Co. when the war broke out, and transformed an electrical machinery works into a munition factory. He organised the work for the part his firm took in the construction of the grid and to that work and the work connected with electrical generating stations in this country and in France and Belgium he brought the trained instinct of an accomplished engineer. The work he did for the Institution of Electrical Engineers as Member of Council and Vice-president will be remembered, especially on the educational side. Mr. Highfield was a past-president of the Association of Supervising Electrical Engineers and of the Batti-Wallah's Society.

The late Mr. W. E. Highfield

Mr. H. A. Ratcliff, whose death was briefly announced in our last issue, was deputy chief engineer of the Manchester Corporation Electricity Department before joining the London Power Co. He had had a long period of service with the Manchester Corporation, being first appointed as a meter tester in 1897. Under his direction the Polygon Depôt, Ardwick, grew into one of the most extensive and up-to-date electro-technical centres in the electricity supply industry. He also carried out pioneer work in the electric lighting of the city. He was appointed chief electro-technical engineer in 1919, and deputy chief engineer in 1925. In 1927 he left Manchester and became chief electrical engineer to the London Power Co. under his old chief, Sir Leonard Pearce, the former chief engineer and manager of the Manchester Corporation Electricity Department. Mr. Ratcliff received his technical education at Nottingham University. He was a member of the Institutions of Civil and Electrical Engineers, and a member of the American Institute of Electrical Engineers. He served on the Council of the I.E.E., and particularly on the Papers Committee and the Membership Committee, of which latter he was chairman for a number of years.

[Elliott & Fry
The late Mr. H. A. Ratcliff

Mr. S. Brotherhood.—The death occurred on May 8th, at the age of sixty-two, of Mr. Stanley Brotherhood, M.I.M.E., head of Peter Brotherhood, Ltd.

Mr. T. Welch.—The death occurred on Wednesday last at the age of fifty-three of Mr. Thomas Welch, assistant mains engineer at the Fulham power station. Mr. Welch had been in the service of the Fulham Borough Council for thirty-four years, and was previously superintendent at the old station.

Mr. H. W. Clothier.—After being brought from Auckland, New Zealand, where he died on March 11th, the remains of Mr. Henry William Clothier, a director of A. Reyrolle & Co., Ltd., were interred on May 10th at Wallsend Cemetery. A service was held in St. Peter's Church, which was largely attended. The family mourners were the Rev. H. L. Clothier and Mrs. Clothier (son and daughter-in-law), Mr. and Mrs. G. D. Clothier (son and daughter-in-law), Mr. and Mrs. W. J. Dean, of Stafford, and Mr. and Mrs. J. Venables. A. Reyrolle & Co., Ltd., were represented by Messrs. L. E. Mold (director), C. A. Stevens (overseas manager and director of the Parolle Co.), L. Mellor, W. A. A. Burgess, D. Mark (Glasgow office), J. Esson (Midland), W. Guns, J. W. Donkin, K. Donkin, and T. Clayton (private secretary). Among others present were Messrs. Poynder (hon. sec., I.E.E., North-East Centre), D. Wilson (I.C.I.), H. Paterson (Metropolitan Vickers), C. Kendlington (British Electrical and Manufacturing Co.), H. Ord (E.I.B.A.), A. K. Wardroper (London Electric Wire Co.), N. Stothard (T. Bolton & Sons, Ltd.), G. G. Mallinson (Westmoreland and District Electrical Supply Co.), H. E. Nelson (representing Lt.-Col. S. E. Monkhouse, North-Eastern Electric Supply Co.), and A. S. Bruce (Pyrotenax Co., Ltd.). Among the many wreaths were tributes from the directors, departments and foremen of A. Reyrolle & Co., Ltd.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

J. J. Smith & Co. (Engineers), Ltd.—Private company. Registered April 28th. Capital, £5,000. Objects: To acquire the business carried on in partnership by John J. Smith and Wm. Smith as electrical and mechanical engineers under the style of J. J. Smith & Co. at 8, Marlborough Street, Liverpool. The directors are: J. J. Smith, 4, Brockholme Road, Mossley Hill, Liverpool; W. Smith, 6, Maxwell Road, West Derby, Liverpool; T. W. Smith, 121, Empress Road, Kensington, Liverpool; and P. Smith, 17, Fernbank Avenue, Huyton, near Liverpool. Registered office: 8, Marlborough Street, Liverpool.

Mannerings & Son, Ltd.—Private company. Registered April 29th. Capital, £200. Objects: To acquire the business of a radio and electrical engineer and contractor, &c., carried on by W. O. Mannerings at 33 and 35, High Street, and 150, Pinner Road, Harrow, Middlesex. The directors are: W. O. Mannerings and Mrs. N. Mannerings, both of 2, Dudley Road, Harrow. Solicitors: Arthur & Co., 29, Euston Road, N.W.1.

Bell Electric & General Supply (Birmingham), Ltd.—Private company. Registered April 24th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers and contractors; to manufacture, deal in, let on hire, hire purchase and repair electrical apparatus and supplies, radio sets, &c. The directors are: E. N. Belsten, 125, Hanging Lane, Northfield, and H. C. Jones, 230, Sladepool Farm Road, Warstock. Registered office: 230, Sladepool Farm Road, Warstock, Birmingham.

Kolster-Brandes, Ltd.—Private company. Registered May 2nd. Nominal capital, £136,000. Objects: To acquire the business carried on by Kolster-Brandes, Ltd., and to carry on the business of manufacturers of and dealers in equipment used in connection with transmitting, receiving, producing, recording and reproducing by electrical or other means, telephones, electric lighting apparatus, electric cables, wires and electrical goods, &c. The subscribers are: W. F. W. Ram and F. W. Edmonds, both of 18, Austin Friars, E.C. Solicitors: Slaughter & May, 18, Austin Friars, E.C.

Corbelux, Ltd.—Private company. Registered May 2nd. Capital, £500. Objects: To carry on the business of general electrical engineers and contractors, manufacturers and importers of and dealers in insulated cables and wires, &c. The directors are: C. H. Bell, O.B.E., and M. H. Bell, both of 6, Spaniards Close, N.W.11, and G. W. Collison, 31, Commonwealth Way, Abbey Wood, S.E. Secretary: Doreen R. Edey, 448, Strand, W.C.2.

Turner Electric Co., Ltd.—Private company. Registered May 6th. Capital, £500. Objects: To acquire the business of an electrical contractor carried on by A. Drysdale Turner at 69, The Wardwick, Derby. The directors are: A. D. Turner, 6, Wesley Road, Alvaston, nr. Derby, and J. D. Turner, Eccles-bourne Farm, Idridgehay, nr. Derby. Registered office: 69, The Wardwick, Derby.

Returns of Electrical Companies

Electrical Finance & Securities Co., Ltd.—Satisfaction to the extent of £5,360 on October 31st, 1937, of trust deeds dated July 29th, 1927, July 6th, 1928, April 24th, 1930, and January 29th, 1932, and registered on various dates from July 29th, 1927, to February 1st, 1932. (Notice filed April 28th, 1938.)

J. & N. Wade (London), Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 20th, 1938, to secure £1,500. Holders: Branch Nominees, Ltd.

Aidas Electric, Ltd.—Charge on Sadia Works, Rowdell Road, Northolt, Mdx, dated April 5th, 1938, to secure all moneys due or to become due from the company to the Westminster Bank, Ltd.

Modern Neon Sign Publicity, Ltd.—Mortgage on properties in Hyde Park Road, Portsmouth, &c., dated April 8th, 1938, to secure all moneys due or to become due from the company to Midland Bank, Ltd.

New Armature Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1937. 745 shares taken up. £745 paid. Mortgages and charges, nil.

Camberwell Relay Service, Ltd.—Capital, £5,000 in £1 shares. Return dated December 8th, 1937. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Wireless Telephone Co., Ltd.—Capital, £1,000 in £1 shares. Return dated November 16th, 1937. All shares taken up. £333 paid. £667 considered as paid. Mortgages and charges, nil.

Albion Electric Lamp Works (1934), Ltd.—Capital, £7,500 in £1 shares. Return dated March 25th, 1937 (filed March 25th, 1938). 7,449 shares taken up. £3,349 paid, £4,100 considered as paid. Mortgages and charges nil.

Orel Micro Electric, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 22nd, 1938, to secure all moneys due or to become due from the company to British Linen Bank.

City Notes

The London Electric Wire Co., & Smiths, Ltd., held its annual meeting on May 11th, when Mr. W. J. Terry (chairman and managing director), who presided, said that the profit and loss account showed an increase of £7,961 over the previous year and would have shown further improvement if a recession in trade had not developed towards the end of the year. During the first six months of the past year orders received and contracts entered into were the highest in the history of the company and record figures in output were established. A rapid decline in trade followed and at the end of the year their business was reduced to lower proportions than at the beginning of the financial period. Some of the reasons for the decline were the unsettled conditions in the United States, a lack of confidence in the European political situation and the fall in price of primary commodities. Extensions and additions to buildings and plant during 1937 had been arranged to improve the working and economic conditions and related only to expected normal demands. Their sales during 1937 had reached record figures in spite of the contraction towards the end of the year. The unspecified contracts carried forward into 1938 were higher than those brought forward at the commencement of 1937, but the rate of deliveries required as against existing contracts had been reduced for the time being. The export sales were slightly increased during the year. The immediate future was difficult to forecast. The lack of confidence which existed was largely psychological, because economically there did not appear to be sufficient reason to justify the decline in trade and it was reasonable to expect improved conditions before the end of the year. The electrical trade, however, continued to expand and there was evidence that their company was maintaining its position in the industry.

Johnson & Phillips, Ltd., held their annual meeting on May 5th, when Mr. G. L. Wates (chairman), who presided, said that the year had been noticeable for a steady expansion of the business and a consequent increase in profit, which was the largest earned since the company was formed. Both with regard to orders booked and sales invoiced their manufacturing departments had had a satisfactory year. Their rubber cable department and their engineering departments, in particular, had worked to the limit of their capacity. Their mains cable department attained practically the same output of work as in the previous year, but there was a slight falling off in orders booked, probably owing to the uncertainty as regards the future felt by many supply undertakings pending knowledge as to the fate of the Electricity Distribution Bill. The contract department also showed a falling off both in orders booked and in output, partly from the above mentioned cause and partly due to the clearing up of large overhead line contracts for the Central Electricity Board. The year was an exceptionally difficult one from the manufacturing point of view, owing to the difficulty experienced during the earlier months in securing deliveries of materials, particularly manufactured and semi-manufactured products. The year was also one of wide fluctuations in raw material prices. The contribution to the rearmament programme so far remained concentrated in their own line of business, and had been taken in their stride without interfering with the normal course of their affairs. Extensions were in progress at Charlton which would provide a much-needed increase of manufacturing facilities on the engineering side and enable them to reduce their costs of production. Their main overseas organisations all enjoyed a record year of business, the exception being China, for reasons obviously beyond their control. The stocks in Shanghai, however, were intact, and their agents there, China Engineers, Ltd., were carrying on business as usual. Each of their electricity distribution companies had shown steady progress during the year, both in kWh sold, revenue received and number of consumers connected. The sales exceeded 21 million kWh and the revenue was approximately £96,000, which represented a fraction over one penny for each kWh sold. The number of consumers was 10,700, the greatest increase in the year coming from the Westmorland area. The last extension at Dunoon had been carried out with a special light overhead line construction of their own design, which enabled them considerably to reduce the cost. They were using this construction in Westmorland, and were thus able to reach the more remote parts, the provision of a supply to which would have been uneconomical with the standard construction. Their "Permel" enamelled wire business had shown a loss during the year, which had been taken care of in the accounts.

Babcock & Wilcox, Ltd.—Presiding at the annual meeting on May 5th Lt.-Col. J. H. M. Greenly (chairman), before proceeding to the business of the meeting, paid tribute to the late chairman, Sir John Dewrance. During the year under review, he said, the volume of business in money value was divided as follows:—43 per cent. from the United Kingdom and 33 per cent. from the dominions and colonies. The balance of 24 per cent. came from Belgium, Italy, Greece, Holland and the Dutch possessions; the Scandinavian countries; a small amount from the U.S.S.R., the Baltic and the Balkan countries, Portugal, Turkey, the Far East and South America. They had been interested for a considerable time in a manufacturing organisation in Japan, and during 1937 they supplied certain material from this country to that company. No difficulties had been met with regarding payments for this material. As regards China, the relatively small total of remaining balances on contracts dispatched at the time hostilities commenced was covered many times over by the reserves, and with regard to contracts in progress at that time, payment in full had now been received for a considerable number of these, and as regards the remainder, guarantees for payment had been received in some cases, while work had been suspended in all cases where there appeared to be any doubt of ultimate payment. The Spanish Babcock & Wilcox Co., which had been affected by the civil war, was now operating satisfactorily; the management was again on the normal basis, and the works suffered relatively little damage as a result of the hostilities. With regard to orders received by them during the year, business had in every respect been up to the standard of previous years, both as regards size and type of boiler units, and also in regard to all the other products which they manufactured. They were finding increasing outlets for their activities in the oil industry. Their manufacturing plant was suitable for producing pressure vessels and other equipment required in modern oil refiners. The Research Department was being steadily developed and was making a continuously increasing contribution to the technical side of their work. With regard to the current year, orders on hand brought forward at the beginning of the year were in excess of those at the corresponding date last year, and constituted a record in their history. During the first three months of this year the volume of orders had been such that all the works were, and would be, well employed throughout the present year.

The Ever Ready Co. (Great Britain), Ltd., reports a profit for the year ended March 31st of £531,575, as compared with £527,333 for 1936-37, to which is added £63,417 brought in, making £594,992. After allocating £146,721 to reserves and £6,229 to the staff benevolent fund, it is proposed to pay a final dividend of 20 per cent. on the ordinary stock, making 35 per cent. for the year, and to carry forward £68,402. The distribution for the previous year on the ordinary stock was at the same rate, but was paid on smaller capital. As already announced, in view of the disturbed world conditions the directors do not recommend the payment of a bonus this year. Last year there was a bonus of 10 per cent. Meeting: June 1st.

Venner Time Switches, Ltd., reports a profit for 1937, after providing for income tax and N.D.C., of £43,629, as compared with £46,734 in the preceding year, to which is added £15,120 brought in, making £58,749. A sum of £11,000 is placed to general reserve, and it is proposed to pay a final ordinary dividend of 17½ per cent. on the ordinary stock, making 27½ per cent. for the year, less tax. The balance carried forward is £15,649. The ordinary distribution for 1936 was 15 per cent., plus a capital bonus of 80 per cent. The report states that sales again show an increase over the previous year, establishing a new high record in the company's history.

The Telephone Manufacturing Co., Ltd., is paying a final dividend of 6½ per cent., less tax, on the capital as increased by the issue of 240,000 5s. shares in June last, making 9 per cent. for the year (same). The new shares did not participate in the 2½ per cent. interim dividend.

The British Oxygen Co., Ltd., has announced a final ordinary dividend of 10 per cent., making 17 per cent. for the year, less tax. This compares with 15 per cent. for 1936 (of which the 7 per cent. interim was on £185,578 less capital), plus a scrip bonus of 6⅔ per cent.

The River Plate Electricity & Other Securities Corporation reports receipts for the period April 17th, 1937 (date of incorporation) to April 15th, 1938, of £68,337, and a net revenue of £46,097. The final ordinary dividend is 6 per cent., making 9 per cent., less tax, and £4,124 is carried forward.

Richard Johnson & Nephew, Ltd., have announced a dividend of 9 per cent. on the ordinary shares for the year ended March 31st (against 8 per cent).

The Compania Hispano Americana de Electricidad S.A. (Chade), is paying a final dividend of 30 gold pesetas on the "A," "B" and "C" shares, and 6 gold pesetas on the "D" and "E" shares. Payment will be made against coupon No. 34 at the rate of Argentine paper pesos 37.5 for the "A," "B" and "C" shares, and paper pesos 7.5 on the "D" and "E" shares.

The Cawnpore Electric Supply Corporation, Ltd., has announced a final dividend of 7 per cent., maintaining the distribution for the year at 10 per cent., less tax.

Siemens Bros. & Co., Ltd., are again paying a dividend of 7½ per cent. on the ordinary stock for the year.

Stocks and Shares

TUESDAY EVENING.

THE actual volume of business in Stock Exchange markets shows little signs of expansion, but at the same time, what Stock Exchange members call the undercurrent is noticeably better. That this undercurrent, or tendency, can be extremely misleading, is a matter of common knowledge, but for the time being its disposition is certainly firm. Assisted by an all-round rise in American Utility and other U.S.A. securities, and further strengthened by the annual report of the Bank for International Settlement, a feeling of confidence is being gradually restored. So far as Americans are concerned, it is said that business conditions in the States are at such a low ebb that any change at all would be, according to this argument, only for the better. President Roosevelt seems to be in a more placable frame of mind than usual, and the Hitler-Mussolini demonstrations of last week-end are deemed to show a willingness on the part of the two dictators to lean towards peace rather than war.

One of the Stock Exchange features of the moment is the strength shown by aircraft shares. Other industrials attract, at present, slight interest from the public, but it is noticeable that whenever shares come on offer, there are generally buyers to be found, although at prices, perhaps, slightly lower than those nominally quoted.

Gilt-edged and the Franc

After having surmounted an astringent Budget in good style, the gilt-edged market was called upon to face up to the franc devaluation and to a resumption of Trustee borrowing. As its first objective, the new French administration's determined policy has, of course, the restoration of such confidence in France as shall persuade French capital to return to its native land. Driven out of the country by the prolonged spell of instability, temporary shelter had been taken by French capital in foreign currencies and securities, a favourite refuge being British Government stocks such as War Loan and Consol 2½ per cents. For the gilt-edged market, repatriation of these funds, which has already started at a lively rate, indicates selling of the stocks hitherto most favoured by Paris; up to date, however, the result has had no more than a faintly depressing effect on gilt-edged prices. At about the same time as the French currency decision, the Australian Government tested the market with a seven million pounds loan, to which a poor response resulted in underwriters being left with well over half the issue. On top of this has come the offer of ten million pounds L.C.C. 3½ per cent. stock at 101¼. In both cases, the usual underwriting commission of one per cent. will be paid.

The Treasury View

The Budget contained one or two hints on the Government's view of the outlook for Stock Exchange activity and prices. For last year, a period of subdued activity in markets caused the Chancellor to feel "extreme disappointment" over the revenue from stamp duties: receipts were the best part of £5 millions short of the anticipated figure. In budgeting for no increase in the current year, however, Sir John Simon made no secret of his belief in the ability of markets to prove him to have underrated their volatility. From his expectation of a comparatively trifling reduction in the yield from death duties, moreover, the Chancellor is evidently relying on a maintenance of security prices, since these have a large say in determining revenue on that account. Coming from a Chancellor whose

conservatism has just rapped unorthodoxy over the knuckles, a good deal of weight attaches to these suggestions that activity and prices in the Stock Exchange are going to be no worse, and maybe a good deal better, than they are now.

Transport and Traction

Preliminary figures for 1937 published by British Electric Traction did nothing to disappoint the market's expectation of another record in profits; the 5 per cent. dividend and 10 per cent. scrip bonus on the deferred stock are now taken almost for granted, and super-taxpayers who are holders of the stock are more pleased even than before with the customary nature of the distribution. At 97⅝, the price of the deferred remains unaltered, as does that of Tillings at 45s. 6d. London Transport "C" stock relapsed 2 points to 77, on further consideration of the impact of the extra petrol tax on the Board's huge fuel bill. The Home Railway market remains dejected by reason of the discouraging traffic returns, practically the only interest being concerned with the lines likely to benefit from the agreement with Eire, and from the stimulus of a cheap franc to Continental travel. In the foreign section, Brazilian Tractions revived to 12 in company with the general spurt in dollar stock prices. The rubber share market is languidly interested in the suggestion that the establishment of a "Buffer Pool" might help to tide over the troubles caused by the inability of the U.S.A. to absorb the present output of the produce.

Electrical Equipment Prices and Dividends

In focusing the limelight on gilt-edged and gold mining securities, and on others susceptible to French currency matters, the chief events of the past week have left industrial shares somewhat in the shadow. Consequently, there has been little encouragement for this market to escape from its lethargic condition, and prices, where changed at all, are usually lower. They have not been helped by the failure of two or three dividend announcements to please the optimists. British Oxygen, with a payment making 17 per cent. for the year, provided one such disappointment; and the declaration by Siemens of a 7½ per cent. dividend—the same as for last year—was less than some people had expected. After having been on the upgrade lately on hopes of a larger distribution, Siemens' shares have reacted from 30s. to 27s. 6d. ex dividend, at which the yield works out to close on 5½ per cent. Telephone Manufacturing shares were also marked down to 8s. 3d. ex dividend, although the 9 per cent. distribution is paid, this time, on larger capital. The cables group is irregular, with Callender's and British Insulated lower at the common level of 4⅜, and Enfields 1/16 better at 2 7/16. General Electric have hardened a little to 75s. Reyrolles are up from 53s. 6d. to 55s. 9d. Aron Meters have shed half a crown to 35s., and Ericssons, at 38s. 9d., have experienced a sharp reaction after the rise in recent weeks. Also on the dull side are London Electric Wires at 30s. ex dividend. The price, nevertheless, was quick to recover the dividend deduction.

Tax-free Investments

In the event of a rise in the income-tax there is an automatic upward adjustment in the prices of those preference shares on which dividends are paid without deduction of tax at the source. Shares of this kind have no special attraction except as a hedge against further increases in direct taxation, but this latter possibility has been enough to set some people scouring the lists of shares on offer. Not a great many issues carry this particular immunity. A few are to be found among companies connected with electrical industries. One example is Lancashire Electric Light & Power 6 per cent. first preference, standing at 36s. 6d., on which the net yield of £3 5s. 9d. per cent. is equivalent to a return of £4 10s. 7d. per cent. where income-tax has to be deducted at the source. Calcutta Electric 5 per cent. tax-free preference are on offer at 28s. 3d. to yield £3 10s. 10d. net, or £4 17s. 8d. gross. Others of the same kind are Vickers 5 per cent. preference which, at 30s. 9d., give a gross return of nearly 4¼ per cent. Madras Electric 5½ per cents, which occasionally come to market at about 27s. 3d., give a gross yield equal to over 5½ per cent. The ultra-cautious will bear in mind that in most cases the immunity extends only up to income-tax of 6s. in the pound.

Miscellaneous Matters

Electricity supply shares are doing better than merely holding their own. Clyde Valleys are still in quiet demand, the price being up to 35s. 6d., ex-rights to the new shares, which are changing hands at around 15s. premium over the offered price of £1. Electrical Distribution of Yorkshire are noticeably strong, at 42s. 6d., and others to have moved upwards during the week include Edmundsons, now 38s., British Power and Light 28s. 3d., North Easterns 32s., and Midland Electrics at 40s. Hendon Electrics, at 42s. 6d., are firm on the expectation of an early amplification of the preliminary notice concerning an offer for the ordinary shares. Interest in Cable and Wireless stocks continues to be comparatively active, with the price of the ordinary fluctuating around 60. During the week the ordinary stock has lost 2 points, to 59, and the preference 10s. to 103. Small losses are shown by Marconi-Marines, at 23s. 3d., and Great Northern Telegraphs, at 35. American "Tel.-and-Tel.," a point higher at 128½, has followed the trend of Wall Street, which has taken a turn favourable to utility stocks. Western Union, at 23½, is 3 points to the good.

Share List of Electrical Companies

	Dividend. Nom. Previous.	Last.	Price May 10.	Rise or Fall.	Yield p.c. £ s. d.
Home Electricity Companies.					
Bournemouth and Poole	1	15	15	63/9	—	4 14 4
City of London	1	7½	7½	34/–	—	4 8 3
Clyde Valley	1	7	8	35/6	+6d.	4 10 2
County of London	1	10½	10½	49/–	—	4 5 7
Edmundson's 7% Pref.	1	7	7	32/–	—	4 7 6
Do. Ord.	1	8	9	38/–	+6d.	4 14 9
Elec. Dis. Yorkshire	1	9	9	42/6	+⅛	4 4 9
Elec. Fin. and Securities	1	12½	12½	48/9	—	5 2 6
Elec. Supply Corporation	1	11	12	51/3	—	4 13 8
Lancs Light and Power	1	7½	7½	32/6	—	4 12 4
Lond. Assoc. Electric	1	—	7	30/–	—	4 13 4
London Electric	1	8	7	35/6	—	3 19 0
London Power Deb. Red.	Stock	5	5	105	—	4 15 3
Metropolitan	1	10	12	50/–	+6d.	4 16 0
Midland Counties	1	7½	8	36/6	+6d.	4 7 8
Mid. Elec. Power	1	8	9	2	+⅛	4 19 0
North Eastern Electric Ordinary	1	6	7	32/–	+1/–	4 7 6
Do. 7% Pref.	1	7	7	31/–	—	4 10 4
Northampton	1	10	10	46/3	—	4 6 7
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	46/3	—	4 6 6
Do. do. 6% Pref.	1	6	6	29/–	—	4 2 9
Scottish Power	1	8	8	36/–	—	4 9 0
South London	1	7	7	32/–	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	18/9	—	8 0 0
Yorkshire Elec.	1	8	8	2	+6d.	4 0 0
Public Boards.					
Central Electricity, 1950–70	Stock	5	5	113	—	4 8 6
Do. 1955–75	,,	5	5	114	—	4 7 9
Do. 1951–73	,,	4½	4½	109	—	4 2 7
Do. 1963–93	,,	—	3½	98xd.	—	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	92	—	2 14 4
London & Home Counties, 1955–75	,,	4½	4½	112	—	4 0 4
London Passenger Transport, A	,,	—	4½	118½	—	3 16 0
Do. do. B	,,	—	5	119½	–1	4 3 8
Do. do. C	,,	4	4½	77	–2	5 10 7
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3
Telegraph and Telephone.					
American Tel. & Tel.	$160	9	9	128½	+1	7 0 2
Anglo-Am. Tel. Pref.	Stock	6	6	106½	—	5 12 7
Do. Def.	,,	1½	1½	26½	—	5 13 2
Cable & Wireless 5½% Pref.	,,	4½	5½	103	–½	5 6 10
Do. Ord.	,,	—	4	59	–2	6 15 7
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	14½	—	3 15 10
Do. do. Pref.	10	6	6	15½	—	4 10 7
Great Northern Tel.	10	20	20	35	–½	5 14 8
Marconi-Marine	1	10	7½	23/3	–6d.	6 9 0
Oriental Telephone Ord.	1	12*	12*	2½	—	4 7 3
Home and Foreign Trams, etc.					
Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	13	—	—
British Electric Traction Def. Ord.	,,	5	5	975	—	—
Do. do. Pref. Ord.	,,	8	8	160	—	5 0 0
Brazil Traction	$100	70 cts.	$1	12	+1½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	99½	—	5 0 6
Mexican Light Common	$100	Nil	Nil	1	—	—
Do. 1st Bonds	$500	5	5	25	+5	—
Victoria Falls Ord.	1	20	12	3½	—	3 16 10
West Riding	1	6½	10	2⅛	—	4 16 10
Manufacturing Companies.					
Aron Electricity Ord.	1	15	15	1½	–½	8 11 6
Assoc. Elec. Ord.	1	10	10	38/–	—	5 5 3
Do. Pref.	1	8	8	37/6	—	4 5 6
Babcock & Wilcox	1	10	10	40/–	—	5 0 0
British Aluminium Ord.	1	10	12½	53/–	+6d.	4 14 2
British Insulated Ord.	Stock	20	20	4½	–⅛	4 11 5
Brush Ord.	Stock	Nil	Nil	25	—	—
Callender's	1	15	15	4½	–½	3 8 6
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/–	12½	12½	26/3	—	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	35/–	—	5 14 3
Enfield Cable Ord.	1	25	25	2⅛	+⅛	—
English Electric	1	Nil	10	30/–	–6d.	6 13 4
Do. Do. Pref.	1	6½	6½	25/6	—	5 2 0
Ericsson Tel.	5/–	25	25	38/9	–½	3 4 6
Ever Ready	5/–	45	35	23/–xd.	—	7 12 2
Ferranti Pref.	1	7	7	27/6	—	5 2 0
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	75/–	+6d.	4 13 4
Henley's	5/–	15	20	20/–	—	5 0 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	10	12½	2xd.	–1/–	6 5 0
Lancashire Dynamo	1	20	25	3½	—	8 0 0
Siemens Ord.	1	6	7½	27/6xd.	–1/6	5 9 1
Telegraph Construction	£1	7½	10	37/6	—	5 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

24627. "Electric lamp attachments." A. D. Froggatt. September 9th, 1936. (483080.)
24641. "Electric mercury or like switches operated by tilting or rotation." A. Cianchi. September 9th, 1936. (483227.)
27445. "Means for regulating d.c. voltage-producing apparatus." General Electric Co., Ltd., and C. R. Dunham. October 9th, 1936. (Cognate application 19767/37.) (483229.)
27465. "Luminous electric-discharge tubes." Franco-British Electrical Co., Ltd., and A. H. Brackensey. October 9th, 1936. (483230.)
27586. "Electric lighting and power systems." Batteries, Ltd., and G. H. Dowsett. October 12th, 1936. (483275.)
27595. "Signal distributing systems." J. W. Sparrowe. October 12th, 1936. (483276.)
27687. "Electrical spark gaps." Automatic Telephone & Electrical Co., Ltd., and R. N. Saxby. October 12th, 1936. (483153.)
27769. "Electric protective arrangements." A. Reyrolle & Co., Ltd., and H. Leyburn. October 13th, 1936. (483238.)
27782. "Barrier plane rectifying cells and photo-electric cells." F. Rother. October 13th, 1936. (483088.)
27796. "Electric motors." British Sangamo Co., Ltd., and G. Gilliver. October 13th, 1936. (483090.)
27813. "Reading lamps and the like." C. H. Keeler. October 13th, 1936. (483240.)
29361. "Electro-magnetic devices having variable reluctance." A. West & Co., Ltd., and J. Bunyan. October 19th, 1936. (483100.)
29499. "Pressure-operated electric switch control devices, specially applicable to refrigerating plants." H. C. Heckman. October 20th, 1936. (483245.)
31561. "Electric motor control systems." Waygood-Otis, Ltd. June 15th, 1936. (483163.)

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7719. "Electrically heated salt-bath furnaces and method of melting the salts therein." O. Uhlendorff. March 16th, 1937. (483179.)
10840. "Electrostatic condensers." R. Bosch Akt.-Ges. April 16th, 1936. (483110.)
14279. "Thermionic-valve amplifiers." Plessey Co., Ltd., J. E. Jones, J. O. G. Rhys-Barrett, and H. S. Haring. May 22nd, 1937. (483116.)
15298. "Electric motor control systems." Waygood-Otis, Ltd. June 15th, 1936. (Divided out of 483163.) (483194.)
18892. "Electrically heated flat-irons." A. H. Stevens. (Winsted Hardware Manufacturing Co.). July 7th, 1937. (483120.)
21192. "Electric condensers." C. Lorenz Akt.-Ges. July 30th, 1936. (483125.)
21203. "Electric liquid-blast circuit interrupters." British Thomson-Houston Co., Ltd. August 1st, 1936. (483203.)
21349. "Electric switches having an automatic overload release or tripping device." Siemens-Schuckertwerke Akt.-Ges. August 3rd, 1936. (483204.)
24523. "Arc-extinguishing means for electric switches." British Thomson-Houston Co., Ltd. September 8th, 1936. (483128.)
24642. "Arc-extinguishing tubes for electric switches." British Thomson-Houston Co., Ltd. September 9th, 1936. (483129.)
33116. "Electric condensers." Siemens & Halske Akt.-Ges. November 30th, 1936. (483144.)
35458. "Electrolytes for use in electrolytic condensers." F. C. Stephen and Telegraph Condenser Co., Ltd. December 22nd, 1937. (483220.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 4th.

Westool Coils. The Link-Power; Performance (lettering and design). No. 583772. Class 8. Electrical induction coils (not for medical purposes).—Westool, Ltd., Westool Works, Putney Bridge Road, S.W.16.

Topstreem. No. 584200. Class 8. Wireless telegraphic and telephonic receiving apparatus, television receiving apparatus and parts thereof.—E. J. C. St. John Chesney, 38, Hugh Street, Westminster, S.W.1.

Elimistat. No. 584450. Class 8. Wireless telegraphic and telephonic receiving and transmitting apparatus and parts thereof.—Sydney S. Bird & Sons, Ltd., Cyldon Works, Cambridge Arterial Road, Enfield.

Jumlog. No. 584451. Class 8. Electric condensers for use in wireless telegraphy and telephony.—Sydney S. Bird & Sons, Ltd.

Synchratune. No. 584452. Class 8. Wireless telegraphic and telephonic receiving and transmitting apparatus.—Sydney S. Bird & Sons, Ltd.

Cleora. No. 577678. Class 11. Electric-discharge tubes for surgical and curative purposes. No. 577679. Class 13. Electric lamps (ordinary).—Claude General Neon Lights, Ltd., Pitman House, Parker Street, Kingsway, W.C.2.

Electrosole. No. 583606. Class 18. Electrically heated vulcanising plant for retreading pneumatic tyres.—James William Llewellyn, 24, Grove Hill Parade, Beeston, Leeds.

Spater. No. 583941. Class 18. Heating apparatus for buildings.—Ferranti, Ltd., Wickentree Lane, Hollinwood, Manchester.

Melopas. No. 581906. Melocal. No. 581907. Class 50. Synthetic resins sold in solid form for industrial purposes, moulding or casting compositions, &c.—Society of Chemical Industry of Basle, Switzerland. (British representatives, Abel & Imray, 30, Southampton Buildings, Chancery Lane, W.C.2.)

Development in Northern Ireland

DURING 1937 (the period covered by its sixth annual report) the Electricity Board for Northern Ireland acquired the non-statutory undertakings at Irvinestown, Fintona, Ballinmallard and Castlederg, where the low-voltage networks were reconstructed by the Electricity Board. With the assistance of an unemployment relief grant it was also enabled to prepare proposals for the development of the southern part of the county of Armagh, and it was actively engaged during the year on a number of distribution schemes. Low-voltage networks were constructed in Dromara, Carryduff and Crossnacreevy, and at the end of the year similar networks were under construction at Keady, Aghalee and Ballinderry. All e.h.v. and l.v. system construction works are now being carried out by direct labour. Since the establishment of the Board expenditure on works carried out by contract has amounted to approximately £600,000, and schemes of a capital nature undertaken by the Board's own staff to about £1,000,000.

A new control station was commissioned during the year at Rosebank and a number of additional main transmission lines were completed, enabling more complete sectionalising. With a view to effecting further improvement the construction of other interconnecting lines was commenced between Lisburn and Lurgan, Banbridge and Ballynahinch, and Armagh and Newry, while a route was surveyed between Donacloney and Banbridge. In addition to providing for the increasing load these will give alternative sources to important centres.

The Board's supplies were principally obtained from the selected stations of the Belfast and Londonderry Corporations, its own station at Enniskillen being closed, except for standby purposes, upon the district being linked with the main transmission system. From Belfast the Board purchased 41.9 million kWh and from Londonderry 3.9 million kWh, itself generating 0.4 million kWh, a total of 46.2 million kWh. The maximum demand was 14,675 kW (13,735 kW in 1936) and the load factor 35.98 (32.9) per cent.

Sales amounted to 39.7 million kWh at an average price of 1.44d., against 33.5 million kWh at 1.42d. in the previous year. The number of consumers (domestic and general supplies) increased by 14 per cent. to 35,936. Mr. Lendrick McMaster, secretary to the Board, states that the exceptionally mild weather in the latter half of the year had an adverse effect on the number of kWh sold, and that although there was a further increase in the number of power consumers the sales in this field did not show the marked expansion which might have been expected owing to the recession in industry arising mainly out of international causes.

An interesting example of the establishment of new industries in the area is the factory of the Ulster Carpet Mills, Ltd., at Portadown, and a photograph in the report shows a stage in the manufacture of one of the largest carpets ever made in Northern Ireland, for the Empire Exhibition.

The income of the Board last year amounted to £258,239 (against £214,988) and expenditure to £146,952 (£128,204). After meeting interest charges, &c., there was a surplus of £1,012 which, with the credit balance from 1936, provided £3,815 to be carried forward. The Board was thus able to meet all charges properly falling to be met out of revenue during a period when, as a result of the issue of stock in the preceding year, the full effect of the higher charges was for the first time reflected in the accounts. At the end of the year it has exercised borrowing powers up to £2,014,000 (excluding loans outstanding in respect of local authority undertakings acquired which were reduced during the year by £3,121 to £37,039) of which £1,964,000 was outstanding. The total indebtedness to depositors was £514,000.

Oils from Gases

The production of hydrocarbon oils from industrial gases is dealt with in a paper read by Dr. W. W. Myddleton before the INSTITUTE OF FUEL on May 12th. The author first refers to factors which determine the national importance of the subject, and then describes the process of Synthetic Oils, Ltd., which has been developed during the past two and a half years. It depends on first converting solids into gas and subsequently deriving from the gas mixture liquid fuel oils of the motor spirit and Diesel classes, as well as lubricating and transformer oils. At one stage of the process the gas is laden with fog composed of oil and wax, and the best means of removing this has been found to be electrical precipitation, but at a voltage lower than is normally used. Commercial plant is now nearing completion at Bedlay Colliery, near Glasgow.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Cinema, Shiprow, for Associated British Cinemas (£35,000); the secretary.

Abertillery (MONMOUTHSHIRE).—Houses (47), Swffryd, Crumlin; D. R. Davies, clerk to U.D.C., Council Offices.

Aldridge.—Cinema, for Avion Cinema Corporation; R. Satchwell, arcnitect, 6, New Street, Birmingham.

Arnold (NOTTINGHAMSHIRE).—Houses (50), Coppice Road, for U.D.C.; J. Herring & Sons, Ltd., builders, High Street, Arnold.

Ashby-de-la-Zouche.—Houses (77), six parishes, for R.D.C.; Goddard & Wain, architects, Station Chambers, Coalville.

Barnsley.—Houses (130), Park House estate (£45,016); borough engineer.

Barrow-in-Furness.—Houses (92), Moor Tarn Lane; Styles & Bates, Ltd.

Beddington.—School, High View (£21,277); H. H. & F. Roll, Ltd.

Bradford.—Houses (175), Acre Lane, Wibsey; Miss Ogden. Shops and offices, Central area site (£49,000); T. Obank & Sons, Ltd. Enlargement of Woodroyd Modern school (£15,100): city architect.

Braintree.—Houses (82), Panfield estate (£27,855); U.D.C. surveyor.

Bristol.—Houses, Gable Road; T. Boddie.

Bromley.—Municipal offices (£74,145); borough engineer.

Carshalton.—Additions to Stanley Road school (£9,188); Downs Estates, Ltd.

Cheshire.—School, Helsby (£65,704), for the County E.C., Chester.

Consett.—Houses (80), Dale Avenue; J. J. Eltringham, U.D.C. architect, Derwent Street, Blackhill.

Coventry.—Houses, Hermit's Croft, St. Christian's Croft, John Grace Street and St. Christian's Road; A. E. Gilks, Lythall's Lane.

Denbigh.—Houses (50), Black Lion Fields (£17,687), for T.C.; H. Lloyd-Jones, builder, Park Street.

Devizes.—Houses (35), eight sites, for R.D.C.; T. W. Snailum, architect, Church Street, Trowbridge, Wiltshire.

Dorking.—Nurses' home, Surrey County Hospital (£17,893); Chapman, Lowry & Puttick.

Dundee.—Factory, Cotton Road, for Melville & Co.

Durham.—Houses (44), Merry Oaks estate; H. E. Pitt, Ltd., builders, Leopold Street, Millfield, Sunderland. Extensions to the Durham County Hospital, for the Management Committee (£60,000): Gradon & Sons, builders, Durham.

Eccles.—Houses (45), near Bradburn Road, Patricroft; J. W. France. Houses (18), Fairless Road; Grimshaws (Builders), Ltd.

Eire (CORK).—Houses (206), Spangle Hill (£101,831), for T.C.; E. Barrett, builder, Glasheen Road, Cork. (KILLARNEY).—Fever Hospital (£24,794), for Kerry Board of Health; J. O'Sullivan & Sons, contractors, Tralee.

Epsom.—Maternity block, County hospital (£48,150); Newberry & Fowler, architects.

Essex.—Block (216 beds) and extensions to female staff block, Suttons Institution, Hornchurch (£51,800), for County P.A.C.

Exeter.—Houses (64), Buddle estate (£25,700); city architect.

Felling.—Houses, Bill Quay and Nest House estates (£62,600); U.D.C. surveyor.

Friern Barnet.—Municipal offices (£44,700), for U.D.C.; Sir John Brown and A. E. Henson, architects, 127, Sloane Street, London, W.1.

Glasgow.—Coachbuilding works, Gallowgate, for Croft Body building and Engineering Co., Ltd., 1009, Gallowgate; J. M Monro & Son, architects, West George Street. Community Centre (£120,000), Alderman Road, for Corporation; city architect.

Harrow.—Cinema, Charlton Road; C. W. Dew, architect, 48, Randall Avenue, Cricklewood.

Hereford.—Works, Barrs Court Road; Jeffrey Tiles, Ltd.

Hillingdon.—Houses (216), Clifton Gardens; H. B. Silver, Ltd., builders, Long Lane, Hillingdon, Uxbridge.

Honor Oak.—Community centre (£22,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.

Hove.—Baths, café, gymnasium and underground car park (£148,331); borough engineer.

Huyton.—Houses (82), Thingwall Farm estate; Milton Estates, Ltd.

Ilford.—Houses (22), Braintree Avenue; T. A. Clark. Eleven shops, New North Road; C. F. Day, Ltd., 705, High Road, N.12. Trolley bus station, near Uphill Road; London Passenger Transport Board. Extensions to South Park school (£11,125), for the E.C.

Kidderminster.—Houses (119), Foley Park estate (£39.996), for T.C.; B. Denning, builder, Birmingham Road, Walsall.

Kingston-on-Thames.—Houses (84), Speer Road, Thames Ditton; Bunting Construction Co., Ltd., 49, Baker Street, London, W.1.

Leeds.—Houses; British Oxygen Co., Ltd. Ice rink at central baths; city architect. Ten shops, Stanningley Road; A. Cansfield. Shops, Upper Town Street; J. W. Watson & Sons.

Linthorpe.—Cinema, Acklam; W. E. Haslock, architect, Albert Road, Middlesbrough.

Liverpool.—Houses (82), Wall Farm estate; Milton Estates, Ltd., Queen's Drive, Wavertree. Houses (423), Woolfall Heath estate, Huyton; borough surveyor.

Loftus.—Houses (70), Backwest estate (£26,016); U.D.C. surveyor.

London.—(BLOOMSBURY).—Large extensions, Tavistock Square (£200,000), for British Medical Association; D. Wood, architect, 1, Old Burlington Street, London, W.1. (ST. PANCRAS).—Rebuilding, Acland Central school (£31,695); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (CATFORD).—Houses (79), Catford Park estate; Wates, Ltd.

Manchester.—Houses, near Nuthurst Road, Moston, for Manchester Housing (1926), Ltd., 22, Brown Street; Halliday & Agate, architects, 14, John Dalton Street.

Middlesbrough.—Stadium (£150,000), for T.C.; borough engineer.

Motherwell.—Houses, Strathclyde Road (£16,000); Scott & Co. (Builders), Ltd., 116, Hanover Street, Edinburgh.

Newcastle-on-Tyne.—Houses, Clovelley Avenue, &c., for Gold and Son; Warenford Place, for Carr and Kirk; and Whamlands Road; F. M. Dryden, architect, Market Street. Houses (26), Hayleazes Road, for G. Bainbridge; Oliver & Leeson, architects, Ellison Place, Newcastle. Houses (48), in flats, Edgefill, for S. Manning; Hetherington & Wilson, architects, County Chambers, Westgate Road, Newcastle-on-Tyne. Bus garage, Carliol Square, for Northern General Transport Co., Ltd.; Fennell & Co., architects, 16, West Street, Gateshead. Cinema, Bridge Crescent, for J. R. Scott; R. Burke, architect, Singleton House, Newcastle-on-Tyne. Walkergate Hospital extension (£12,600), for C.C.; Alexander Anderson, Ltd., contractors, Stanmore Road.

Northampton.—Premises, Grafton Street and Regent Square; Ideal Benefit Building Society. Police court, &c., Campbell Square (£72,955); A. Glenn & Sons, Ltd.

Northumberland.—Institution, Stannington, for the C.C. (£98,000); county architect, County Hall, Newcastle-on-Tyne.

Oxford.—Cinema, Marston Road, for Calcutt & Hunt, Ltd.

Pontefract.—Houses (60), Mill Hill Lane; W. H. Young.

Portsmouth.—Flats (102), Craneswater estate; city engineer.

Royton.—Houses (128), Milton Street site; U.D.C. surveyor, Town Hall.

Rugby.—Municipal buildings (£68,265); borough surveyor.

Scarborough.—Rebuilding of Upper Station for the Central Tramway Co.; T. W. Whipp, architect, 15, Valley Bridge Parade.

Sheffield.—Houses (28), Sharrard Grove; Hallewell Estates, Ltd., Foxwood estate. Flats (21) and garages, Westbourne Road; J. H. Judge & Co. (Builders), Ltd., 233. Broomhall Street. Extensions to premises of Darwins, Ltd. (£90,000), Fitzwilliam Road, Tinsley.

Shirley.—Factory, Highlands Road, for the Co-operative Wholesale Society.

Southgate.—Houses (30), Chandos Avenue; Davies Estates, Ltd.

Southport.—Dwellings (24), Warwick Street; borough engineer, Town Hall.

South Shields.—Houses (12), Commercial Road, for T.C.; borough engineer. Houses (16), Grosvenor Road; J. W. Ridley, builder, Park Lane, Sunderland. Houses (14), Page Avenue, &c.; Henderson Bros., builders, Tyne Dock, South Shields. Shops and houses in flats, Horsley Hill Road, for R. Summerson; H. Hill, architect, 10, Winchester Street.

Stalybridge.—Houses (50), Springs Lane; borough engineer.

Stretford.—Factory, Ayres Road; Austin Walters & Son, Ltd.

Sunderland.—Fire station at north side of town (£20,000); borough engineer.

Swindon.—Schools, Drove Road; director of education, Education Department, Civic Offices.

Thurnscoe.—Houses (800), Low Grange; F. Scrivener & Co., builders, 397, Oxford Road, Reading.

Torquay.—Extensions to isolation hospital; P. W. Ladmore, borough engineer, Town Hall. Extensions to South Devon technical college (£15,148), for the E.C.; Stephens & Son, Ltd., contractors, Bedford Circus, Exeter.

Uxbridge.—Reconstruction of Savoy Cinema, High Street, for Union Cinemas, Ltd.; L. H. Kemp, architect, 15, Lower Regent Street, London, S.W.1.

Wallasey.—Amusement buildings (£50,000); G. Wilkie.

Wallsend-on-Tyne.—Houses and shops, East Farm estate; J. Robson, builder, East Farm. School, High Farm, for the E.C.

Walsall.—Houses (40), Mill Place; E. J. Glover.

Warrington.—Factory, Bewsey Street; Lancashire Cables, Ltd.

West Hartlepool.—Hall, houses and shops, Dyke House estate (£20,452); borough engineer.

Widnes.—Houses (60), Halebank estate No. 2, for T.C. (£25,237); H. Brookfield & Son, Ltd., builders, Higher Road, Hale Wood, Liverpool.

Wolverhampton.—Houses (38), Marsh Lane; borough engineer, Town Hall. Factory, Dickson Street, for Read Engineering Co., New Zoar Street. Houses (92), Pond Lane (£37,626); A. M. Griffiths & Son, Ltd. Police buildings (£115,000); borough engineer. Factory, Pool Street; C. G. Blane.

Worcester.—Police station, court and fire station, site adjoining Copenhagen Street and Birdport, for Corporation; P. Thomas, architect, 10, Cathedral Road, Cardiff.

Worthing.—Houses (19), Bernard Road; Novean Homes, Ltd. Houses (52), Sompting Manor estate; Sompting Manor Estates, Ltd.

Wrexham.—Houses (48), White Gate Farm estate, King's Mill Road, for T.C. (£18,307); G. F. Sumner & Sons, Ltd., builders, Ashfield Stanstey, Wrexham.

Yorkshire.—School, Dale Street, Heckmondwike, for the West Riding E.C.; county architect, Wakefield.